



INSTITUTE FOR DEFENSE ANALYSES

**2003 IDA Cost Research Symposium:
Cost of Evolutionary Acquisition/
Spiral Development**

Stephen J. Balut, Project Leader

Lynn C. Davis

David W. Henningsen

Robert Hiram

Terry Proffit

Russell A. Vogel

Jan Young

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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, at the IDA Cost Research Symposium, CAIG meets with representatives from selected government offices, Federally Funded Research and Development Centers, and military universities to discuss ongoing and planned cost research activities. 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 2003 cycle. Its purpose is to make the material available to those who participated in the 2003 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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I. 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 and 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 DoD's technical capabilities to forecast future costs. Near the beginning of each year, during the DoD Cost Analysis Symposium, the CAIG reviews the status of the 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 2003 IDA Cost Research Symposium was held on May 22, 2003. The symposium, jointly sponsored by OSD CAIG and IDA, has been held every year since 1989 (see References [2 through 16]). This document contains the proceedings of the 2003 symposium and catalogs defense cost research projects in progress or planned at the time of the symposium.

A. Symposium Agenda

Table 1 shows the agenda for the 2003 symposium. The theme was the cost of evolutionary acquisition/spiral development. The symposium opened with remarks (presented in Chapter II) from Stephen Balut, Director of IDA's Cost Analysis and Research Division, and a keynote address by Rick Burke, Chairman of the OSD CAIG.

The next event was a panel discussion on the subject of evolutionary acquisition/spiral development (EA/SD). Since this concept is new to the DoD, there was some disagreement and much discussion among panel members regarding the definition of EA/SD and what it means to defense cost analysts. Former OSD CAIG chairman David McNicol, currently a Senior Research Fellow at the Institute for

Defense Analyses, moderated this panel discussion. Invited panel members included RADM (Ret) Dave Altwegg of the Missile Defense Agency (MDA); Bob Buhrkuhl from the Acquisition Resources and Analysis (AR&A) office in the Office of the Director (Acquisition Technology and Logistics); Dave Duma, Deputy Director, Operational Test and Evaluation (OT&E); John Landon, Deputy Assistant Secretary of Defense (DASD), Command, Control, Communications, Intelligence, Surveillance, and Reconnaissance (C3ISR) and Space Systems; and Richard W. McKinney from the Office of the Under Secretary of the Air Force.

Table 1. Agenda for the 2003 IDA Cost Research Symposium

Welcome and Opening Remarks— <i>Stephen Balut, IDA</i>
Keynote Address— <i>Rick Burke, OSD CAIG</i>
Panel Discussion
Evolutionary Acquisition/Spiral Development:
– <i>What Is It?</i>
– <i>What Does It Mean for Cost Analysts?</i>
Moderated by Dave McNicol, IDA
Panel Members
RADM (Ret.) Dave Altwegg, MDA/PI
Bob Buhrkuhl, AR&A
Dave Duma, Deputy Director, OT&E
John Landon, DASD(C3ISR & Space Systems)
Richard W. McKinney, Office of Under Secretary of the Air Force
Panel Presentations
Evolutionary Acquisition/Spiral Development (EA/SD):
– <i>Current Cost Research Viewed from the EA/SD Perspective</i>
– <i>EA/SD Cost Areas in Need of Research</i>
Panel Members
Russell Vogel, OSD CAIG
Jan Young, MDA
Lynn Davis, AFCAA
David Henningsen, DASA(C&E)
Robert Hiram, NCAD
Invited Presentation
Leasing Defense Systems: UK Experience
Terry Proffitt, UK Ministry of Defence, PFG/CF

During the afternoon session, a panel of representatives from the OSD, the MDA, and the military departments described research activities within their organizations that have direct or indirect application to the subject of EA/SD. Russell Vogel, Executive Secretary of OSD CAIG, started this discussion with a description

of the demand for cost estimates in the DoD along with the CAIG's understanding of the meaning of and impact of EA/SD on defense analysts. The other members of the panel were Jan Young, Director of Cost at the Missile Defense Agency; Lynn Davis, Air Force Cost Analysis Agency (AFCAA); David Henningsen, Office of the Deputy Assistant Secretary of the Army (DASA), Cost and Economics (C&E); and Robert Hiram, Naval Cost Analysis Division (NCAD). Panel members commented on particular areas where additional research investments are indicated. These presentations are reproduced in Chapter III.



Figure 1. Richard McKinney, David Duma, David McNicol, David Altwegg, Bob Buhrkuhl, and John Landon.



Figure 2. Stephen Balut introduces panel participants Russ Vogel, Robert Hiram, David Henningsen, Chris Beatty (who stood in for Jan Young in the afternoon), and Lynn Davis.

The last event of the day was a presentation titled “Leasing Defense Systems: UK Experience,” given by Terry Proffitt of the UK Ministry of Defence, Pricing and Forecasting Group/Cost Forecasting (PFG/CF). This presentation, reproduced in Chapter IV, was a timely topic in light of the U.S. Air Force’s recent interest in leasing defense systems.

B. Symposium Participants

Table 2 lists the offices and organizations invited to participate in the symposium and the names of the people who represented them this year.

Table 2. Participants in the 2003 IDA Cost Research Symposium

Office/Organization	Abbreviation	Representative
Office of the Director, Program Analysis and Evaluation	PA&E	Richard Burke
Missile Defense Agency	MDA	Jan Young
Deputy Assistant Secretary of the Army for Cost and Economics	DASA(C&E)	Robert Young
Army Materiel Command ^a	AMCRM	Kenneth Freund
Army Tank-automotive and Armaments Command	TACOM	Richard Bazzay
Army Aviation and Missile Command ^a	AMCOM	Frank Lawrence
Army Space and Strategic Defense Command	SMDC	Jackson Calvert
Naval Cost Analysis Division	NCAD	David Ziemba
Office of Naval Research	ONR	Jane Alexander
Naval Air Systems Command	NAVAIR	Dave Burgess
Naval Sea Systems Command	NAVSEA	Barbara Young
Naval Surface Warfare Center, Dahlgren Division	NSWCDD	Roxanne Harvey
Naval Surface Warfare Center, Carderock Division	NSWCCD	Scott Gustavson
Air Force Cost Analysis Agency	AFCAA	Joseph Kammerer
Aeronautical Systems Center, Air Force Material Command	ASC/FMC	Michael Seibel
Air Force Space and Missile Systems Center ^a	SMC	Deidr Eberhardt
Electronics Systems Center, Air Force Material Command ^a	ESC/FMC	Ron Phillips
UK Ministry of Defence, Pricing and Forecasting Group/ Cost Forecasting ^a	PFG/CF	Terry Proffitt
Air Force Institute of Technology	AFIT/ENV	Michael Greiner
Defense Systems Management College ^a	DSMC	Martha Spurlock
Aerospace Corporation	AEROSPACE	Carl Billingsley
MITRE Corporation ^a	MITRE	Paul Garvey
RAND Corporation	RAND	John Graser
CNA Corporation	CNAC	Matthew Goldberg
Institute for Defense Analyses	IDA	Stephen Balut

^a These offices/organizations did not submit project summaries this year.

IDA asked participants to prepare summaries of ongoing and planned cost research studies at their offices and organizations for use at the symposium and in this document. Appendix A of this document lists the titles of the studies summarized, and Appendix B contains the summaries themselves.

II. Opening Remarks, Stephen Balut, IDA

Welcome
to the 15th Annual
Cost Research Symposium
Sponsored by the
OSD CAIG
IDA

Welcome to the 15th annual Cost Research Symposium. I'm Steve Balut, Director of the Cost Analysis and Research Division here at IDA. This symposium was established and continues to be a forum for discussing ongoing and planned defense cost research.

This symposium was originated and funded by IDA starting in 1989. Several years later, the Office of the Secretary of Defense, Cost Analysis Improvement Group (CAIG) jointly funded the effort and integrated this activity into its cost research planning cycle.

PARTICIPANTS

- *Offices known to sponsor and conduct defense cost research*
 - Government offices
 - FFRDC's
 - Defense universities
 - International guests
- *For-profit firms excluded*
 - Allows open discussion of plans

From the beginning, participants in this symposium have been all offices known to conduct or sponsor defense cost research. These include government offices, mostly within the Office of the Secretary of Defense (OSD), Federally Funded Research and Development Centers, and Defense Universities. From time to time, we enjoy the participation of international guests from offices that conduct cost research in their countries.

Attendance at this symposium is by invitation only. For-profit contractors are not invited to avoid possible conflict of interest and competitive advantage. The symposium encourages free and open discussion of future investment opportunities and plans within participating organizations. Such discussion allows for the possibility of collaborative funding of research of common interest and promotes sharing of research findings.

THEME

- *Evolutionary Acquisition/Spiral Development (EA/SD)*
 - What is it?
 - Implications for the cost community?

The theme of this year's symposium is evolutionary acquisition/spiral development (EA/SD). The defense acquisition community has been directed to apply these new ideas in acquisition programs. However, the terms "evolutionary acquisition" and "spiral development" are not well understood, even within the professional acquisition work force.

We hope, here today, to come to a consensus on what these terms mean and what the implications are for the defense cost community.

AGENDA

- *Keynote address*
- *Panel of defense acquisition experts*
 - What is EA/SD?
 - What are implications for cost community?
- *Cost Research panel from OSD CAIG, MDA and Service cost organizations*
 - Cost research ongoing and needed in light of EA/SD
- *Invited presentation*
 - “Leasing Weapon Systems: UK experience”
 - Terry Proffitt, UK DPA

As usual, our first event will be a keynote address by the Chairman of the OSD CAIG, Dr. Rick Burke. For the remainder of the morning, we will observe and take part in a discussion by an invited panel of acquisition experts who will sort out the meanings of “evolutionary acquisition” and “spiral development” and explore the implications of EA/SD for the defense cost community.

After lunch, we will observe another panel discussion by representatives of the OSD CAIG, Missile Defense Agency (MDA), and the military departments. This panel will identify and discuss ongoing and planned cost research projects at their organizations, identify which projects are related to EA/SD, and suggest areas where additional research is needed to assist in implementation of EA/SD within their organizations.

The final event will be an invited presentation by Mr. Terry Proffitt of the UK Defence Procurement Agency on the subject of UK experience with leasing weapon systems. This topic is particularly interesting in light of the U.S. Air Force’s recent interest in leasing Boeing aircraft to act as aerial refueling tankers.

III. EA/SD Panel Presentations

A. Russell Vogel, OSD CAIG

Evolutionary Acquisition & Spiral Development

**Cost Estimating Research
Activities and Strategies: FY 03-08**

**Russ Vogel
CAIG Executive Secretary**

OSD/CAIG

Sustained Commitment to Acquisition Excellence

Two of Secretary Rumsfeld's Five Key Priorities Are Primarily Focused on Acquisition Excellence

- Reform DoD structures, processes, and organization, **including the Acquisition Process**
- **Introduce New Weapons Systems to Address Our New Circumstances**
 - **Reduce Cycle Times of Our Weapons**
 - **Insert New Commercial Technology**

DoD Transformation

OSD/CAIG

Under Secretary Aldridge's Goals

- **Achieve Credibility and Effectiveness in the Acquisition and Logistics Process**
- Revitalize the Quality and Morale of the Acquisition Workforce
- Improve the Health of the Defense Industrial Base
- Rationalize the Weapons Systems and Infrastructure to the Defense Strategy
- **Initiate High Leverage Technologies to Create Weapon Systems and Strategies of the Future**

OSD/CAIG

DoD Key Focus Areas

- **Deliver advanced technology to warfighters faster**
 - Rapid acquisition with demonstrated technology
 - Full system demonstration before commitment to production
- **Reduce total ownership costs and improve affordability**
 - Cost as a requirement that drives design, procurement, and support
 - Increased competition
- **Deploy interoperable and supportable systems**
 - Integration of acquisition and logistics
 - Interoperability demonstrated prior to production

Improved performance (including quality) at lower cost.

OSD/CAIG

DoD 5000 Policy Revision

- *Why Change the Current Policy*
 - Current Policies Considered Overly Prescriptive
 - Do not constitute an acquisition policy environment fostering efficiency, creativity, and innovation
- *Revised Policy Objectives*
 - Encourage Innovation and Flexibility
 - Permit Greater Judgment in the Employment of Acquisition Principles
 - Focus on Outcomes instead of Process
 - Empower Program Manager's to Use the System vice being hampered by over regulation

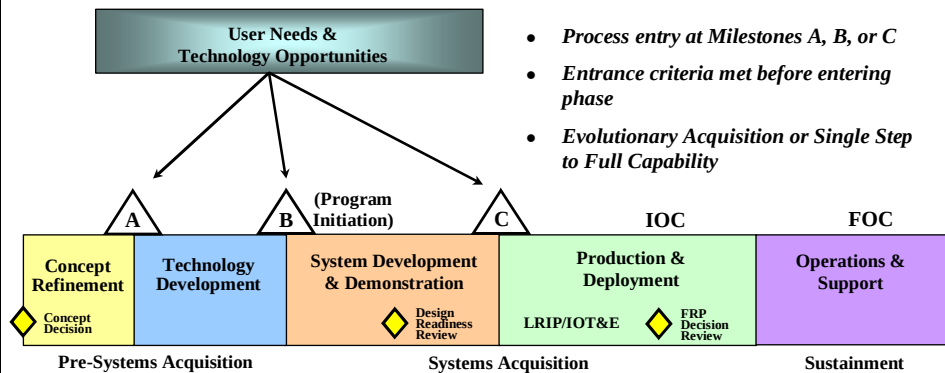
OSD/CAIG

DoD 5000 Policy Revision

- **DoD Directive 5000.1** (*Attachment 1 to DepSecDef Memo*)
 - Principles retained; innovation/flexibility emphasized
- **DoD Instruction 5000.2** (*Attachment 2 to DepSecDef Memo*)
 - Acquisition management model unchanged
 - Focused on Required Outcomes and Statutory Requirements
- **DoD Regulation 5000.2**
 - Cancelled as mandatory document—becomes “Guide”, not a regulation; characterized as non-mandatory
 - Content will be:
 - Expectations (TEMP, C4ISP etc.)
 - Best Practices
 - Lessons Learned
 - Guidance on practice and procedure
 - Information Retained and on Internet

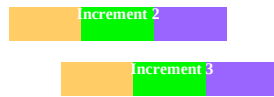
OSD/CAIG

The 5000 Model



OSD/CAIG

Evolutionary Acquisition: The Principles



- DoD's *Preferred Approach*
- Deliver *Useful Capability* to the Operational User as Rapidly as Possible
- “Increment 1” Based on *Proven Technology* (the 80% solution), JROC Approved *Time-Phased Requirements*, Projected Threat Assessments, and Demonstrated Manufacturing Capabilities
- “Increment 2” and Beyond *Fully Funded and Independently Baselined as Technology Matures*. Scope, Performance and Timing of Subsequent Increments based on continuous communication among the the Requirements, Acquisition, Intelligence and Budget Communities

OSD/CAIG

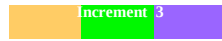
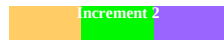
Evolutionary Acquisition: Two Approaches



- *Incremental Development*: A desired capability is identified, an end-state requirement is known, and that requirement is met over time by development of several increments, each dependent on available mature technology.
- *Spiral Development*: A desired capability is identified, but the end-state requirements are not known at program initiation. Requirements are refined through demonstration and risk management; there is continuous user feedback; and each increment provides the user the best possible capability
 - MDA authorizes work to begin on subsequent Increments in consideration of above as well as Full Funding, Test and Sustainment Strategy, etc.

OSD/CAIG

Evolutionary Acquisition



OR *Single Step to
Full Capability ?*

Key Considerations

- Urgency of Requirement
- Maturity of Key Technologies
- Interoperability, Supportability, and Affordability of Alternative Acquisition Approaches
- Cost/Benefit of Evolutionary vs. Single Step Approach

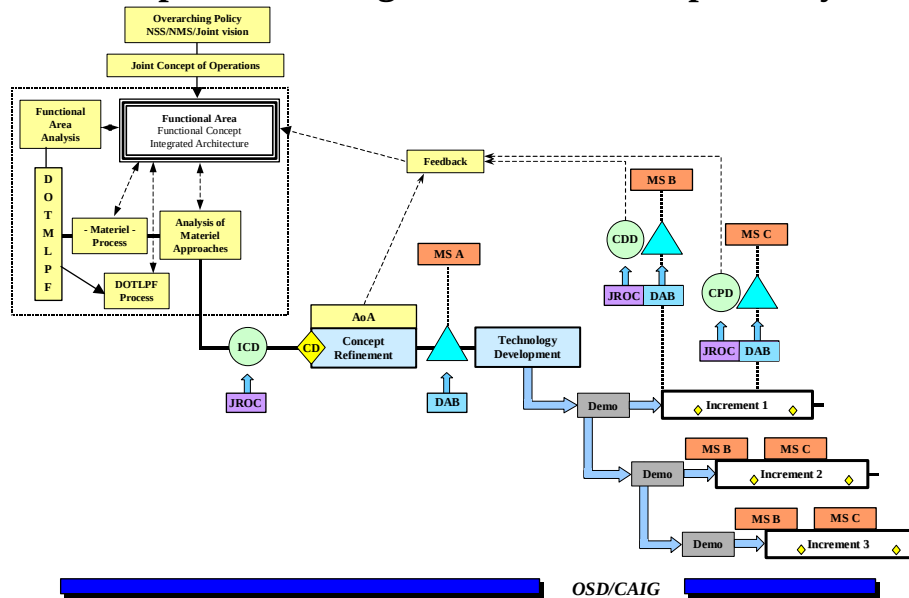
OSD/CAIG

Changes to Requirements Generation System

- Joint Staff determined current system does not adequately support development of an integrated and effective joint force.
- Joint Staff Memo (7 Oct 02) cancelled sections of CJCSI 3170.01B describing Mission Needs Generation and Capstone Requirements Generation Process
- Process revisions being developed and coordinated with the acquisition community and in conjunction with revision to the 5000 series policies
- Revised process in final coord
 - Joint Capabilities Integration and Development System (JCIDS)

OSD/CAIG

Evolutionary Acquisition and Spiral Development Joint Capabilities Integration And Development System



DoD 5000 Policy Revision

Current Status

- Interim Guidance replaced by *re-issuance* on May 12, 2003
 - DoDD 5000.1 “The Defense Acquisition System”
 - DoDI 5000.2 “Operation of the Defense Acquisition System”
- DoD Regulation 5000.2 was not *re-issued*. Guidebook released on May 12, 2003
 - Supports Non-Mandatory Best Practices, Lessons Learned, and Expectations
 - Posted to the DAU 5000 Resource Center (<http://dod5000.dau.mil>)
- Defense Acquisition Policy Working Group (DAPWG) managing Guidebook update/JCIDS integration effort

OSD/CAIG

DoD 5000 Re-issuance Changes

- **Interfaces with JCIDS (CJCSI 3170.01C)**
 - Functional Capabilities Board, Initial Capabilities Document
 - AoA early in JCIDS process to evaluate all feasible solutions
- **MDAs may tailor Regulatory requirements**
 - CARDS
 - AoAs
- **CAIG 5000 Series will be updated to address:**
 - DoDD 5000.4 “CAIG Cost Analysis” (mandatory timelines and procedures)
 - DoD 5000.4-M “CARD Development”
 - DoD 5000.4M-1 “Contractor Cost Data Report System”
 - DoD 5000.4M-2 “Software Resource Data Reporting System”
 - Operations and Support Estimating Manual

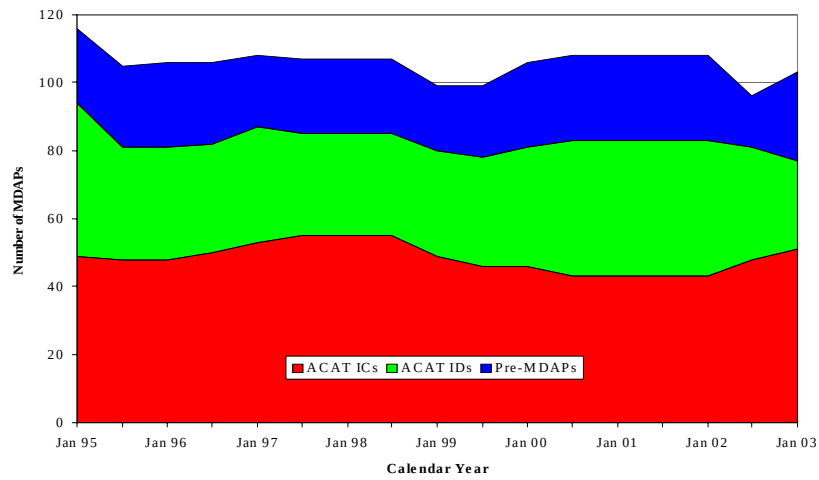
OSD/CAIG

Evolutionary Acquisition & Spiral Development: Cost Estimating Backdrop

- Continuous RDT&E activity w/ each increment; higher total investment
- WBS intensive activity to capture multiple increments
- MDA SDD and Production decisions/reviews with each increment
 - LCC defined by scope of program under review
 - Budget “wedges” in/beyond FYDP
- Multiple configurations to support in field
 - O&S definition, higher O&S costs
- Not applicable to all programs
 - F-35, CVN-21, Comanche

OSD/CAIG

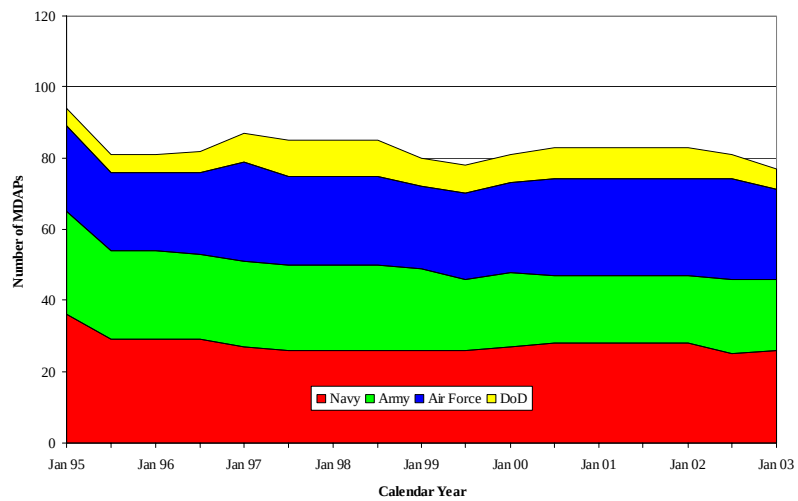
MDAPs by Acquisition Category



OSD/CAIG

MDAPs by Service

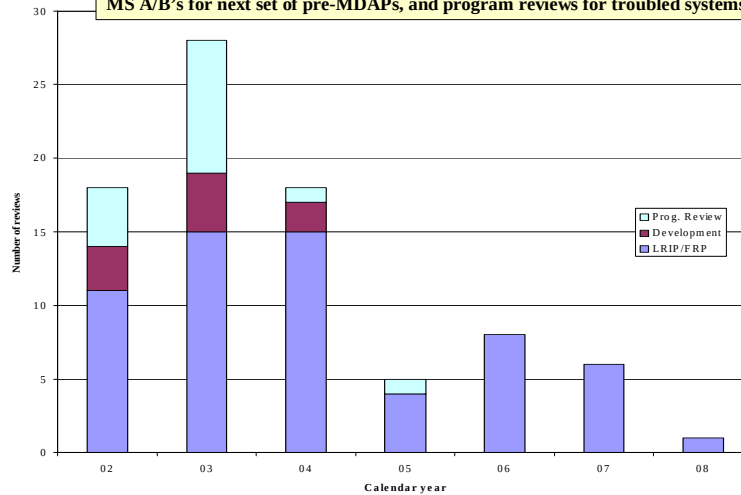
ACAT ICs and IDs



OSD/CAIG

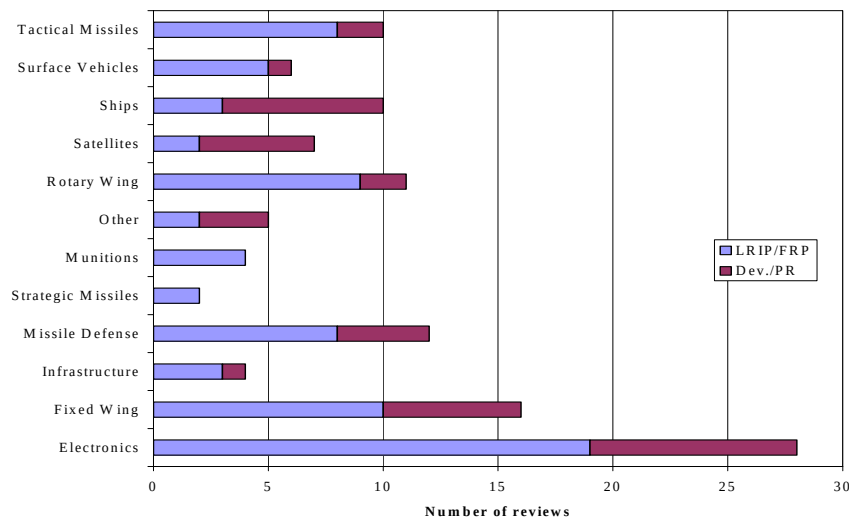
Currently Directed Reviews for ACAT IC and ID Systems (Excludes pre-MDAP system reviews)

Most post CY03 reviews are not yet on the books: MS A/B's for current set of pre-MDAPs, MS A/B's for next set of pre-MDAPs, and program reviews for troubled systems.



OSD/CAIG

FY03-08 Reviews by Commodity Class



OSD/CAIG

Systems with Upcoming Program Reviews, MS A's, and MS B's by Commodity Class

Munitions & Tactical Missiles	Rotary Wing	Fixed Wing	Electronics	Satellites	Ships	Missile Defense
HIMARS	Comanche	JSF	CEC-Blk II	SBIRS-H	DD(X)	BMDS**
JDAM PIP	V-22	Tanker Rplmt	MP RTIP	WGS	CVN-21	
AGM-88E			HPCM	NESP	SSN 774	
	CSAR*	MMA*	MCS		LPD-17	
Common Missile*	VXX*	E/A-18G*		TSAT*	T-AKE	
SDB*		MC2A*	ACS*	AWS*		JLENS*
			JTRS-Cistr 3*	BAMS*	COBRA JUDY*	MEADS*
			AOC-WS*	MOUS*	LHA(R)*	
			B-2 RPP*	SBR*	MPF(F)*	
			E-2 Adv Hwk*		LCS*	
			GCCS-AF*			

* pre-MDAPs - these systems may never have a formal review

** PRs for THAAD, PAC-3 Blk 04, ABL, SBL

OSD/CAIG

Summary of EA & SD Costing Challenges

- Methodologies
- Software
- Electronics/avionics
- Integration and testing
- Payloads

OSD/CAIG

Methodologies

- **Spiral Development/Evolutionary Acquisition**
 - New acquisition approach to development and production of weapon systems.
 - Spiral development of systems shortens time to field but also suggests each spiral/block requires separate milestone reviews (e.g. Global Hawk)
 - Need models/methodologies to reflect this shift in acquisition strategy.
- **Use of Commercial systems to satisfy DoD system requirements**
 - History of true use of COTS and savings/costs incurred
 - Modification of commercial systems to satisfy DoD requirements

OSD/CAIG

Software

- **Large software development efforts are common across DoD programs.**
 - Ship, aircraft, ground, and ballistic-missile defense programs all 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 to populate software database that captures baselines and block/spiral 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

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, MEADS, MIDS-LVT. 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., MP-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

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

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

CAIG Study Activities-FY03

- *UAV/UCAV Systems and Platform Cost Estimating*
- O&M Program Balance and Cost Related Drivers
- *Improved Methodologies for Estimating Development Costs*
- *Aircraft Cost Study - Indirect Labor & Material / Remanufacture*
- FYDP Normalization
- Military Hospital Cost Analysis (Should-Cost Model)
- *C4ISR Functions and Components Cost Estimation*
- Resource Analysis of DoD Central training
- DLA Aviation Investment
- *Methodologies for Estimating Evolutionary Acquisition Programs*
- *Cost Research Symposium*
- Training Course for Newly Assigned CAIG Analysts
- *Plant Specific Overhead Rates*

OSD/CAIG

B. Jan Young, MDA



Agenda

- Introduction
- Problems with existing cost estimating methodologies in this new environment
- An emerging interim approach
- Long-term solutions
- Near-term cost research projects sponsored by MDA/PIE



Cost Estimating Methodologies

1. Parametric Estimate – Equation derived from multiple systems

$$DESIGN(FY98\$M) = 5.41R^{1.39} D^{0.84}$$

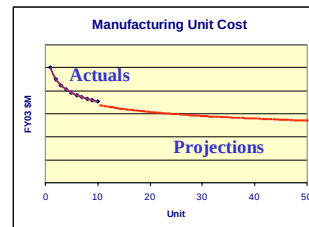
Where R is Detection Range and D is Diameter (cm)

2. Analogy Estimate – “Like Patriot” or “15% more challenging than Patriot”

Heuristic Estimate – 2 Hrs/SLOC

3. Engineering Estimate – “Bottoms Up” or “Grass Roots” Estimate – method often used by industry
4. Projection From Actual Data – Uses programs own historical data to project future costs

All methodologies rely on useful cost data collected during program execution

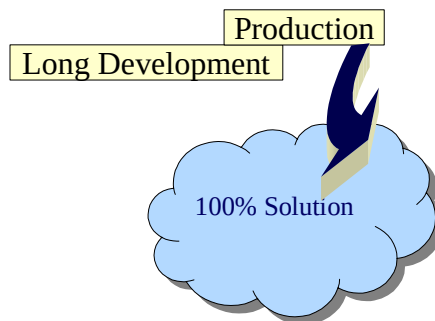


3

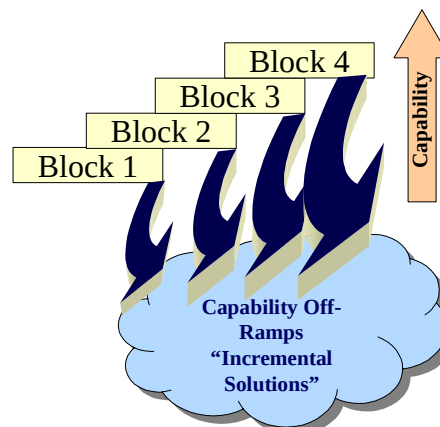


Acquisition Approach

The “Grand Design”



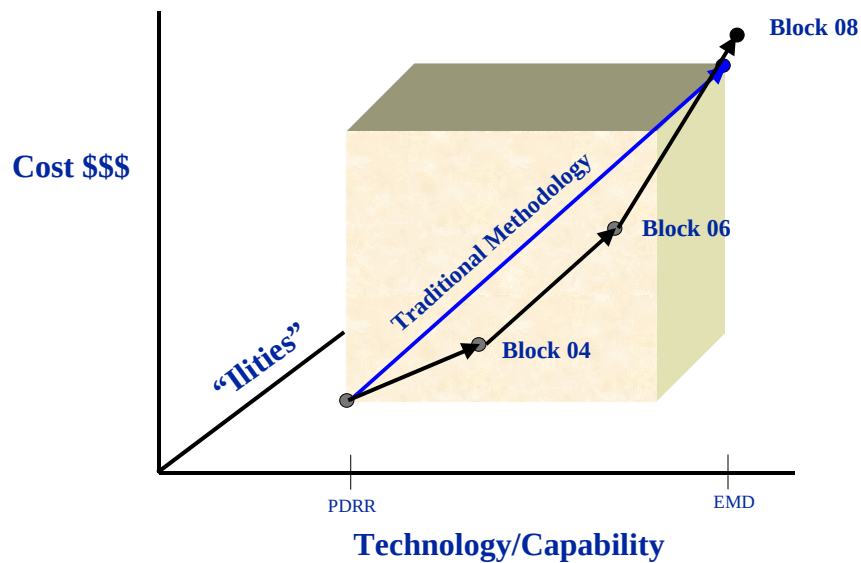
Evolutionary Acquisition



4



Estimating Costs of Evolutionary Acquisition Why it is a Challenge



5



Historical Data Current Data to Estimate Evolutionary Acquisition Program

“Grand Design”

100% solution
Requirements-based
Large cost database
Long development period

Evolutionary Acquisition

“60% - 80%” solution
Capabilities-based
No cost database
Shorter development to “A” model

Our database is likely to overestimate block costs
and underestimate total development costs

The cost community is being forced to rethink its
databases and methods

6



Near-term Solution Schedule-based Methodologies

- Cost analysts cannot do their job without data
 - We do not have a database of evolutionary acquisition costs
 - Most data reflects “grand design” development and production
 - We need data!!!
- How do we adjust our methodologies that use historical “grand design” to estimate evolutionary programs?
 - Evolutionary programs and capability programs should decrease the time to deliver a capability
 - We are proposing to use Schedule as a predictor of costs

**Schedule-based estimating methods are
the near-term solution**

7



Near-term Solution Parametrics (Then and Now)

- Historical Missile Model
 - $SE = .270 * (PME) * e^{(.625 * Fielded)}$
 - PME = non-recurring prime mission equipment costs
 - Fielded = 1 if system will be fielded; 0 if system is experimental
- New Missile Model
 - $SE = .042 * (PME + CL + STE) * (Months)^{.412} * \exp(-.415 * D\&V)$
 - PME = total prime mission equipment costs
 - CL = total command and launch hardware costs
 - STE = system test & evaluation costs
 - Months = Development time
 - D&V = D&V program, 1 or 0

**It is not the CER itself that is important here
– The fact that we are using “time” is**

8



Near-term Solution Analogy using Schedule and Burn Rate

- Time is money
- $\text{Cost} = \text{Duration} * \text{Burn Rate}$

Schedule Estimating Methodologies

- Parametric Schedule Estimating Relationships (SER)s – few exist and may not be applicable for MDA
- PERT/CPM Analysis
- Subject Matter Expert Opinion
- Analogies

Burn Rate Estimating Methodologies

- Parametric Burn Rate Estimating Relationships – few exist and may not be applicable for MDA
- Staffing and Labor Rate Analysis
- Analogies

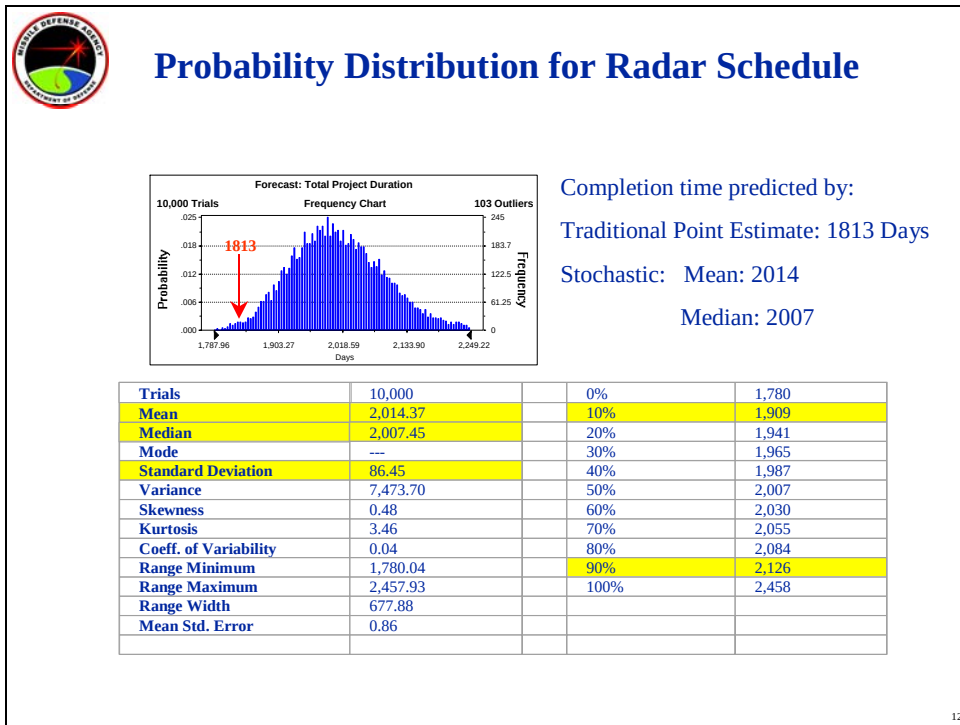
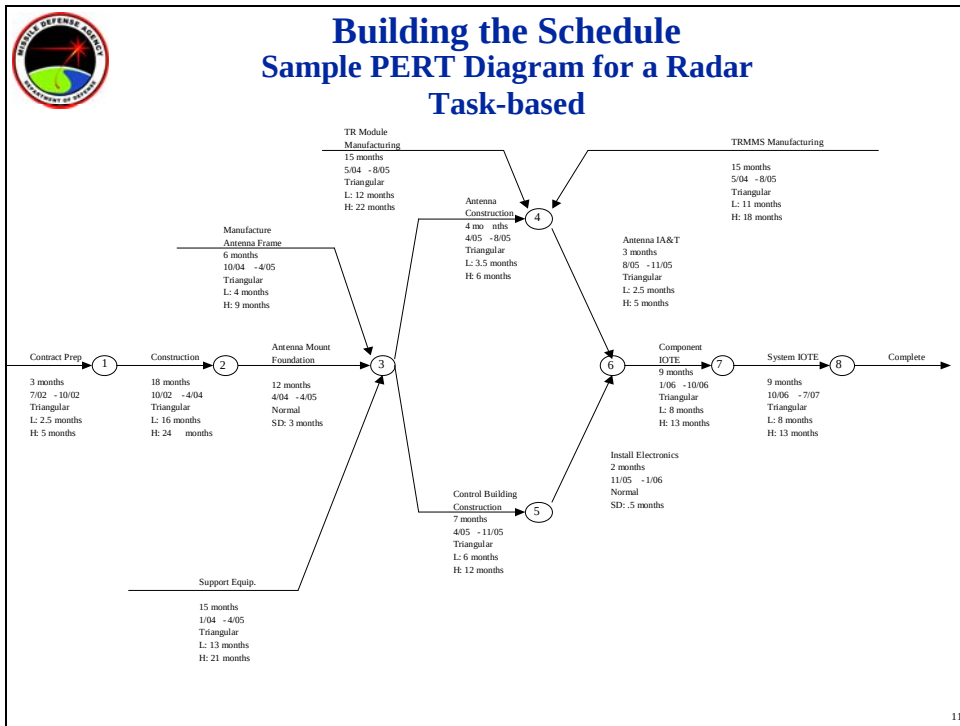
9



Building the Schedule

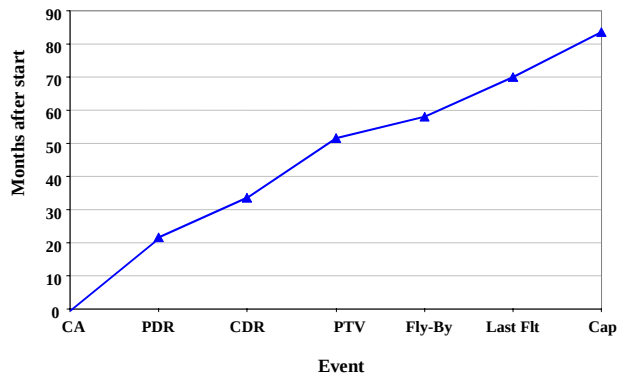
- Build a PERT network (Project Evaluation and Review Technique)
 - Decide on level of detail
 - Aggregate tasks
 - Identify start and end nodes
- Analogy
 - Discuss with experts the relationships between individual events
 - Show experts (technical team) historical benchmarks & get input
 - Time to First Flight, etc.
 - Duration time for key events (e.g. Design time for a booster)
 - Key events - DR1, DR2, First Flight, DR3, End of Program
 - Generic schedules by WBS for a system architecture
 - Missile, Sensor, C2BMC, Launcher, ST&E, SE/PM
 - Assume one item as long pole
- Develop probability distributions for tasks in the network

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Building the Schedule Sample Missile Schedule Intervals between Key Events (Analogy)



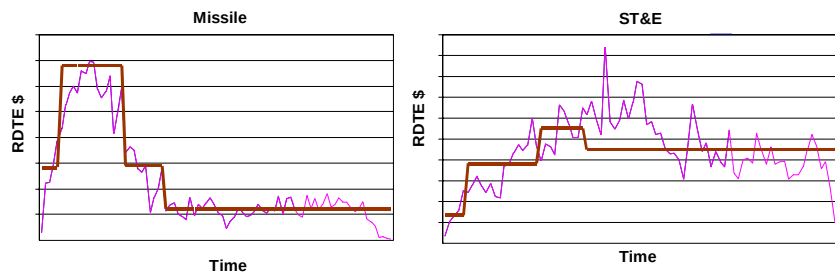
Path	Nominal range	
	Min	Max
decision to FUE		
end OT to decision DT/OT		
DT/OT production DT/OT fab to 1st		
DT/OT LL to Fab		
exit criterion flight to Fab		
1st flight to exit	12	24
RFI to 1st flight	0.5	3
1st FTR del to RFI	6	18
FTR fab (CDR) to 1st del	12	18
FTR LL (PDR) to Fab	12	18
start to PDR	12	18
time (months)	xxx	yyy

- Distribution around each key event
 - History
 - Expert Opinion
- Monte Carlo simulation run for probability distribution

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Estimating Cost Using Burn Rate Analogy



- These charts reflect historical data for 2 WBS items
 - Data is collected for each WBS
 - Key dates are PDR, CDR, First Flight, and End of Program
- Estimate for an evolutionary program is based on this staffing profile applied to its estimated schedule (illustrated previously)
 - Estimate can be done as low a level as the schedule is estimated at (and for which you have cost data)

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Future Work

- In process of modifying our cost, performance, technical, and programmatic data collection.
 - Paves the way for tomorrow's analogies and parametric CERs
 - Requires that data be collected by Block and possibly lower levels within – no longer rolled up into a single value
- Collect incremental changes in performance with incremental changes in cost to find relationships
- Collect schedule data at levels below a master schedule and by WBS
- Continue to derive new methods where schedule is an important predictor of cost

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MDA Cost Research Products Recently Completed

Missiles • Missile Cost Improvement Slope Analysis • Missile Cost Model Version 3.12 • THAAD Robust Analog Methodology (TRAM) Model	
Sensors • Ground Based Radar Cost Model • MDA Radar Cost Model Version 1	BMC3 • Theater Air and Missile Defense Interoperability Cost Model
Space and Directed Energy • Deployable Optics Development and Manufacturing	Other • Environmental Life Cycle Cost Model • Cost Differential to Harden MDA Systems Study • Installation Base Operations Cost Estimating Support Guide

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MDA Cost Research Products Ongoing

Missiles Missile Development Engineering Cost Estimating Relationship	Space and Directed Energy Develop Improved Methodologies for Estimating Costs of Space System Payloads
Sensors MDA Radar Cost Model Updates	Other - Improvements to the MDA Cost Risk Methodology - MDA Target and Payload Cost Model - MDA Cost Research Workshop - Using U.S. Census Data to Estimate Cost - Schedule Analysis for MDA Programs
BMC3 - Estimating Costs of Interoperability as a Countermeasure Solution - Software Analysis of Platform functionality - Single Integrated Air Picture (SIAP) Systems Engineer Interoperability Lessons Learned	

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New Technology Programs Areas of Interest

- | | |
|---------------------------|--------------------------|
| • Miniature Kill Vehicle | (Missile Area) |
| • High Altitude Airship | (Sensors Area) |
| • Advanced Discrimination | (BMC3I Area) |
| • Laser Radar – LADAR | (Sensor & Missile Areas) |
| • Next Generation Radar | (Sensors Area) |
| • Forward Based Radar | (Sensors Area) |
| • Micro Satellites | (Sensor & Space Areas) |

Our challenge is to discover improved methodologies to estimate costs for development of these technologies and for integrating them into the Ballistic Missile Defense System (BMDS) and Program Elements.

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Headquarters U.S. Air Force

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Research Efforts **The Air Force Perspective**



LYNN C. DAVIS
Lead Research Analyst
Air Force Cost Analysis Agency
22 May 2003

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Summary

- Contributing Organizations
- Spiral Development Implications
- Areas Most in Need of Research
- Current Research Efforts Supporting Estimating
- Notional Studies and Spiral Development
- Closing Remarks
- General Research Projects Supporting Estimating

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2



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Contributing Organizations

- Air Force Cost Analysis Agency (AFCAA)
- Aeronautical Systems Command (ASC)
- Space and Missile Command (SMC)
- Electronics Systems Command (ESC)
- RAND

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3



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Spiral Development and Research

- How has our estimating process in the Air Force adapted to spiral development guidance to provide war fighters with capabilities earlier and with less capability initially?
 - What are we doing to support fielding operational capabilities in as short a time as possible?
- What research is ongoing that addresses problem areas?
- What are the AF's evolving research needs?

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Implications of Spiral Development

■ Purpose

- Rapidly delivering war-winning capability
- At program initiation, desired capability is identified but end-state requirements unknown
- Requirements are defined through demonstration and risk management
- Continuous user feedback
- Each increment provides the user the best possible capability at the time

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The Air Force completed a study of Global Hawk's spiral development and I'm going to discuss the findings of that study.



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Spiral Development and Estimating Capabilities

BENEFITS

- Allows development of new capabilities supporting operational requirements
- Provides opportunity to insert new technologies that reduce cost of ownership or accelerate fielding
- Refines current capabilities based on user feedback, testing or experimentation
- Accelerates or defers increments within spirals without revising overarching spiral objectives



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This slide discusses the benefits of using spiral development.



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Spiral Development and Estimating Capabilities

DRAWBACKS

- User must accept interim configurations for a period of time
- May become a source of funding for “less” flexible programs
- Test community must adopt mindset that partial capability is a success, not failure
- Requirements must be defined to accommodate continuing improvements over time
- Logistics community must accept plan for multiple funded configurations
- Finance and program leadership must accept content in later spirals will change based on technology and user needs



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Changes in the mindset of various communities involved will be required, such as accepting interim configurations, understanding that partial capability is a success and not a failure and understanding that logistical considerations are going to have to be adapted to multiple funded configurations. Further, FM and AQ will need to adapt to the fact that program changes will occur as technology and user needs change and transform.



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Spiral Development and Estimating Capabilities

ESTIMATING OBSERVATIONS

- Complexity of estimating vastly increased
 - Inter-twined activities and rapidly changing requirements
 - More coordination between estimators, program managers and engineers
- WBS elements are mix of stand alone activities within spirals and across multiple spirals
- Forces 'a la carte menu' approach to estimating
 - Many items poorly defined
 - Constantly re-prioritizing future spirals
- High schedule concurrency between phases means high risk (production and operations)
- Tremendous stress on logistical and coordinating activities



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Estimating complexity vastly increases using spiral development due to rapidly changing requirements, increased coordination processes, using a mix of WBS elements within and across spirals and the constant re-prioritizing of future spirals. There is a tremendous stress on logistical and coordination activities.



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Spiral Development and Estimating Capabilities

ESTIMATING OBSERVATIONS

- Detailed estimating data highly desirable, particularly for subcontractors
 - Allows for easy 'in-element' adjustments created by spiral process
 - Current configuration data may have no relevance to future spiral activities
 - Limits usefulness of actual cost data
 - Trend data has diminished value
- Changing program dynamics means changing contractor dynamics providing increased risk in contractor specific cost issues (overheads, etc.)
- Constant change equals low efficiency
- Experience is vital, premium placed on art form side of estimating



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While detailed estimates are highly desirable in each spiral, it needs to be recognized that a current configuration may have no relevance to future spirals and that trend data's value has greatly diminished. Further, actual cost data's usefulness is limited. The constant change that occurs with spiral development equals low efficiency and experience becomes more highly prized as pertinent data becomes more scarce.



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Spiral Development and Estimating Capabilities

LESSONS LEARNED

- Risk analysis is a must!
- Constant education of outside users on program data interpretation
- Retrofit, Logistics, SE/PM cost issues greatly magnified
- Learning effects are minimized
 - Continual step backs in hours and efficiencies due to spiraling

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Spiral Development and Estimating Capabilities

CONCLUSIONS

- Spiral Development does provide the ability to rapidly field capability, but with significant risks:
 - Compression of program schedule with resulting concurrency and risk
 - Rush to field without adequate logistical preparation
- Cost estimators face traditional problems but in an accelerated environment
 - Classic trade-off of time vs. definition magnified by changing program dynamics
 - Risk analysis holds increased importance



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Spiral Development Factors That May Limit or Degrade AF Capabilities

- **Data**
 - **Deletion and/or Reduction in Cost Data Collection/Reporting**
 - Limits use of Historical Data due to constantly changing spiral activities
 - **Program Definition/CARDS**
- **Need for Institutional Change**
 - Finance and program leadership must accept that program content in later spirals is subject to change based on technology and user needs!

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Spiral Development Factors That May Limit or Degrade AF Capabilities (Cont'd)

- **Continuous Review Cycle**
 - Continuous changes in APB, SAR, CARD, LCCE with significant changes
 - Keeping documentation current and consistent is tough
- **Perpetual CAIG involvement and oversight**
 - Schedule challenge of data collection vs. briefing process
- **Congruence of RDT&E, Prod, O&S, FMS**
 - Significant synergistic effect between phases
 - Changes impact all phases immediately
 - High degree of coordination required to keep program synchronized

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Areas Most in Need of Research for Estimating Aircraft

- Avionics/Electronics
- Software
- Test and Evaluation
- Propulsion
- Development in General
 - Spiral development process impacts



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The areas most in need of further research to assist in estimating Aircraft are: Avionics, Software, Test and Evaluation and Propulsion.



Research Efforts in Support of Aircraft Estimating

- **Avionics/Electronics**
 - **Aircraft Avionics Database**
 - Review current data
 - Identified new data points to add to ACDB
 - **Data Trends**
 - Radar trends indicate lack of technical data
 - Signal processor
 - Data processor
 - Transmitter
 - Antenna
 - Controls and Displays
 - Lack of subsystem cost visibility

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Research Efforts in Support of Aircraft Estimating

■ Software

■ Aircraft Software Data Track

- Collect software cost and metrics data by aircraft
- Focus on JSF, F/A-18E/F, C-130 AMP and Comanche
- Case histories and trends on
 - Software size growth
 - Productivity
 - Reuse
 - Cost growth

■ Software Case Studies/Data Collection

■ Aircraft Modification (C3I platform integration update) in FY04

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As noted in our previous briefing on research projects in 2001, software estimating still remains a challenge. The Aircraft Software Data Track project was initiated to collect software cost and metrics data by aircraft. The focus will be on JSF, F-22, F-18E/F, C-130 AMP, Global Hawk and Comanche.

Case histories and trends on software size growth, productivity, reuse, and cost growth relative to baseline estimates by acquisition phase will be developed and documented.



Efforts in Support of Aircraft Estimating (Cont'd)

- **Test and Evaluation**
 - **Aircraft and Guided Weapons Test and Evaluation Cost Estimating Methodologies**
 - Identify T&E process changes and cost impacts
 - Develop updated methodologies and relationships

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Another research project supporting Aircraft estimating is Aircraft and Guided Weapons T&E Cost Estimating Methodologies. It will identify changes in the T&E process with potential cost impacts and develop updated methodologies and relationships to produce more accurate T&E estimates for aircraft or air-launched weapon systems life cycle.



Efforts in Support of Aircraft Estimating (Cont'd)

■ Propulsion

■ Aircraft and Aircraft Modification Sufficiency Review Handbook

■ The handbook provides a summary of:

- Methodologies, Crosschecks and Metrics**
- Modules included for:**
 - F-22, F/A-18E/F and V-22 and**
 - Propulsion, avionics, Systems Engineering and Program Management (SE/PM) and aircraft system test**

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In the area of Propulsion, as well as other areas to be estimated, we have commissioned the Aircraft and Aircraft Modification Sufficiency Review Handbook as a guideline for performing sufficiency reviews of aircraft and aircraft modification programs.

The handbook provides a summary of cost estimating research efforts, methodologies, crosschecks and metrics. The handbook sensitizes inexperienced analysts to key estimating issues affecting R&D and Production. Separate modules are included for F-22, F/A-18E/F and V-22 and propulsion, avionics, Systems Engineering and Program Management (SE/PM) and aircraft system test modules.



General Efforts in Support of Aircraft Estimating

- **FY04**
 - **Effects of Ramp Rate on Learning Curves**
 - **Firm Fixed Price and Engineering Change Orders Project**
 - **Aircraft Sufficiency Review and Cost Tool Handbook**
 - **Avionics Learning Curves**
 - **Commodity Drive Effects of Inflation Indices**
 - **Cost Reduction Initiatives**
 - **MACDAR**

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Areas Most in Need of Research for Estimating Missiles

- **Propulsion**
- **Airframe**
- **Launch and Guidance Control**
- **Software**
- **Aircraft Integration**



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The areas most in need of research to support Missile estimating are: Propulsion, Airframe, Launch and Guidance Control, Software and Aircraft Integration.



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Research Efforts in Support of Missile Estimating

- **Missile and Munitions Sufficiency Review Handbook**
 - Methodologies, Crosschecks and Metrics
- **Analysis of Systems Engineering and Program Management Costs**
 - Analyzes effects of out sourcing, integrated product teams and acquisition reform on SE/PM costs
 - Analyzes past use of factors to estimate SE/PM and their applicability in today's environment
 - Will look at other methodologies available to cost estimators for SE/PM costs

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The Missile Sufficiency Review Handbook summarizes basic cost estimating crosschecks. It provides Development and Production missile factor analysis cost estimating methods. Both median and acceptable ranges of learning curve slopes for production data sets were developed. Also learning curve slope probability curves for all production hardware elements were developed. For RDT&E, time-phasing information was developed. A cost per pound metric was developed for selected missile systems. The handbook contains a complete summary of basic Production factor analysis cost estimating methods and a summary page for quick reference.

The Estimating Methodologies for Systems Engineering/Program Management Costs study analyses SE/PM costs and trends by contractor, type of system, historical trends and other variables. The study develops a set of cost estimating methodologies for SE/PM to be used in the early stages of a program; before detailed technical and programmatic information is available the focus is on military aircraft and tactical missiles.



General Efforts in Support of Missile Estimating

- **FY04**
 - **Tri-Service Missile Database with CEAC**

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Areas Most in Need of Research for Estimating AIS

- **Software**
 - **COTS**
 - **Non-COTS**

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The area we have most in need of research for supporting AIS estimating is Software.



Research Efforts in Support of AIS Estimating (Cont'd)

■ COTS Software

- Performance Activated COTS Estimation Relationships (PACER) model (formerly COTS)**
 - Need commercial off-the-shelf software data**

■ Non-COTS

- Software Cost Estimation and Sizing Methods, Issues and Guidelines**
 - Criticality of software size in estimating**
 - Assesses government and contractor methodologies**
 - Guidelines for future software estimates**

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Specifically, we are in need of research for collecting commercial off-the-shelf software data.

The Software Cost Estimation and Sizing Methods, Issues and Guidelines project addresses the fact that software size estimation is critical to providing credible software cost estimates. This project will assess the current industry and government methods used to estimate software size and provide a set of guidelines for use of those cost estimation methods.



General Efforts in Support of AIS Estimating

- **FY04**
 - AIS Historical Data Collection/Cleansing
 - PACER (COTS Electronics Model) update

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Areas Most in Need of Research for Space Systems Estimating

- **Hardware**
- **Software**
- **Ground Systems**
- **Other challenges include:**
 - **Spacecraft**
 - **Payload**
 - **Support Equipment**
 - **Launch and Operations**
 - **Orbital Support**

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Areas most in need of research for Space are: Hardware, Software and Ground Support Systems.



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Efforts in Support of Space Systems Estimating

- **Hardware**
 - No current efforts
- **Software**
 - **Unmanned Spacecraft Cost Model and Passive Sensor Cost Model (USCM/PSCM)**
 - **Renamed USCM in FY04**
 - Collecting new spacecraft data
 - Renormalizing and integrating data
 - Some contractors excluded from model
 - Boeing proprietary data issues

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We have one research project currently being done that will support Space cost estimating and it is: Unmanned Spacecraft Cost Model and Passive Sensor Cost Model.

This effort is collecting new spacecraft data and renormalizing existing data to integrate into the new system called Space System Cost Model (SSCM). Not all contractors are included in the model. Boeing is hesitant to provide data due to concerns with distribution of their proprietary data.



Efforts in Support of Space Systems Estimating (Cont'd)

- **Ground Systems**
 - **Space System Sufficiency Review Handbook**
 - **Guidelines for Sufficiency Reviews**
 - **Updates to Costing Methodologies**

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The Space System Sufficiency Review Handbook will provide guidelines to perform sufficiency reviews on Spacecraft buses, various types of payloads, ground segment, integration activities, SE/PM and launch costs. It will address cost drivers and typical areas of risk and identify areas requiring updated costing methodologies to better reflect state-of-the-art processes in the development, production and deployment of space systems.



Efforts in Support of Space Systems Estimating (Cont'd)

■ **Ground Systems (Cont'd)**

■ **Ground Satellite System Architecture Support**

- **Addresses ground satellite system architectural design**
- **Determine relationships between orbiting satellites and respective ground systems**
- **Develop a “notional” ground system architecture**
- **Identify the major causes of variation within ground systems**
- **Will improve estimates for integration costs**

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Ground Satellite System Architecture Support project is part of COTS (now renamed PACER). This research project will address the architectural design of ground satellite system as well as depicting various technical parameters for desired performance. It will determine relationships between orbiting satellites and respective ground systems and identify and depict current architecture of ground systems for orbiting satellites. Further, it will attempt to identify common elements within existing ground systems and develop a “notional” ground system architecture. An attempt will be made to identify the major causes of variation within ground systems such as communication vs. sensor mission or numbers of satellites to be controlled and use that to adjust the “notional” architecture.



Efforts in Support of Space Systems Estimating (Cont'd)

■ **Ground Systems (Cont'd)**

■ **Ground Antenna Systems**

- **Assess feasibility of COTS ground antenna system**
- **Assess interoperability with space based applications**
- **Consider applicable integration, test, and installation activities**
- **Produce performance based CERS**

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Ground Antenna Systems project is also a part of the COTS (PACER) effort. It will assess whether there is a workable COTS ground antenna system. It will assess interoperability with space-based applications and consider applicable integration, test, and installation activities. The study will identify ground systems compatible with the current COTS model and produce performance-based CERS.



General Research in Support of Space Systems Estimating

- **FY04**
 - **PACER (COTS Electronic Model)**
 - **Phasing of Dollars**
 - **Study on Risk at Various Levels of WBS**
 - **USCM Phase VIII**
 - **NAFCOM**
 - **Software Support for Space Systems**

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Notional Studies That Would Address the Spiral Development

- **Research Projects**
 - **There are currently no projects specifically designed to determine the effects of Spiral Development**
 - **Air Force is struggling to support increasing load of required program estimates**
 - **More frequent estimates required to support spiral development**
 - **Have increased the number and type of research projects in an effort to bring better data to the estimators**

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Closing Remarks

- **AIS Software Estimating Improvement**
 - **Change in DOD 5000 requirements**
 - **Submission of Software Resource Data Reports to Defense Cost and Resource Center (DCARC) formerly CCDR Project Office**
- **Space Systems Estimating Improvement**
 - **AFCAA is supporting CAIG Space Systems estimating**
 - **Collaboration with NRO**
 - **Provides AFCAA with access to additional databases and data sources**

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We are expecting an improvement in software cost estimating due to the latest DOD 5000 requiring submission of the software resources data report to the DCARC Office. This report will collect software estimates/data at the time of a CARD, at contract award, and at completion. It will also include size, effort, language, staff and phase. Data will eventually help provide code/estimate growth factors.

We are expecting improvements in Space System estimating also. Space policy has appointed the Air Force Cost Analysis Agency assist the CAIG with Space estimates. Additionally, we are collaborating with the National Reconnaissance Organization (NRO) in preparing space estimates and expect to have access to additional sources of data using some of NRO's databases.

Another area we are addressing to improve space estimating is Phasing. This has gained in significance due to the fact that space estimates are going to be used more closely for budgeting purposes.



Closing Remarks (Cont'd)

- **Air Force investigating updating risk policy Air Force-wide**
 - Navy and MDA already providing risk estimates to senior leaders with cost estimates
- **Cost Analysis Community of Practice (CoP) Portal**
 - For use by all Services and throughout DoD
 - Allows easier collaboration, cuts cycle time
 - Provides one-stop shopping for data, information and expert knowledge
 - Can be accessed at:
<https://afkm.wpafb.af.mil/ASPs/Cost/Entry.asp?Filter=Q>

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Cost Analysis Community of Practice Portal is the “yellow pages” for cost analysts enabling easy access to code data, cutting cycle time.



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Conclusion

- **Data**
 - Need has become even more pressing for current data on new systems being estimated
- **Organizations working together FM, AQ and LG must learn to:**
 - Adapt to new dynamics of spiral development
 - Develop and adjust their processes to facilitate these activities

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General Research Projects in Support of Estimating

- **General Research projects**

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General Research Projects in Support of Estimating

- **Estimating Methodologies for Non-Air Vehicle Work Breakdown Structure Costs, Rand, 2004**
- **Military Aircraft Data and Retrieval (MACDAR) System Update, NAVAIR, 2003**
- **F/A-22 and F/A-18E/F Engineering/ Manufacturing Development Case Studies: Lessons Learned, Rand, 2003**
- **Assessing Cost Reduction Initiatives and Returns on Investment for DoD Weapon System Programs, Rand, 2003**
- **Aircraft and Aircraft Modification Sufficiency Review Handbook, RAND, 2003**

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Some additional efforts in support of Aircraft Estimating are:

- Estimating Methodologies for Non-Air Vehicle Work Breakdown Structure Costs. This task will analyze the nature of current below the line costs and trends. It will develop a set of cost estimating methodologies to be used in the early stages of a program, before detailed technical and programmatic information is available. The methodologies will also be useful for crosschecking detailed estimates of more mature programs.
- Updates to MACDAR have improved our insight into labor learning curves and material data and curve analysis. Material databases have been validated and verified on F-14, F-15, F-16, F/A-18A/B/C/D and AV-8B. The Air Force is working to resolve data collection issues on F-18E/F with the program director.
- The F/A-22 and F/A-18E/F EMD Case Studies Lessons Learned project will evaluate manufacturing contractors approaches to measuring weight growth, cost and schedule growth, development strengths and difficulties as well as other factors. The study will compare it to the priorities of the US Navy and US Air Force. Lessons learned from each aircraft will be useful for developing cost

estimates for the next generation of military aircraft and other major weapons developments.

- The Assessing CRIs and ROI for DoD Weapon System Programs project was to assess industry and government methods used to determine ROI for CRI on the F-22 prior to its milestone. The study was to evaluate the tools and propose new ways to analyze investments on programs.



General Research Projects in Support of Estimating (Cont'd)

- **ACE-IT Enhancements, Tecolote, 2002**
- **Cost per Flying Hour Contingency Calibration Factors, LMI 2003**
- **Analysis of the Sources of Cost Growth in Selected Acquisition Reports, Rand, 2002**
- **Impact of Price Based Acquisition (PBA) on DOD Programs, Rand, 2003**
- **Firm Fixed Price Contract Study, Technomics, 2003**

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The CPFH Contingency Calibration Factor effort will take the current CPFH rates, which are developed for peacetime operations and develop factors that represent Contingency operations. It will all provide the capability to normalize historical data that reflects contingency operations to a peacetime scenario. This study funds the cost factors and the development of marginal cost factors that measure the incremental costs in weapon system changes.

The Analysis of the Sources of Cost Growth in Selected Acquisition Reports study includes updating and automation of a comprehensive cost growth database using information from Selected Acquisition Reports. SARs are the only consistent documentation of program costs and characteristics over long periods of time for all Major Defense Acquisition Program weapon systems.

The Impact of Price Based Acquisition on DOD Programs project will ascertain whether genuine cost savings and cost avoidance due to PBA are real, quantifiable, and universally applicable. The study will identify pitfalls that may arise due to the use of PBA. It will recommend “lessons learned” for improving the implementation of PBA on a wider spectrum of programs.

The Firm Fixed Price Contract Study will assess whether various types of contracts ultimately affect the cost of weapon systems in follow-on efforts. Recommend approaches to estimate costs and prices for follow-on Firm Fixed Price (FFP) production contracts using contractual information from EMD and

Production contracts with options. The contractor will provide documented cost factors derived, CERs and/or recommended approaches based on any trends.



U.S. AIR FORCE

General Research Projects in Support of Estimating (Cont'd)

- **Estimating Methodologies for Aircraft and Missile Testing Costs, Rand, 2003**
- **NASA Air Force Cost Model (NAFCOM), SAIC, 2002**
- **Automatic Update of AFI 65-503 Using Air Force Total Ownership Cost Database, Battelle, 2003**
- **Cost Factor Model Support (Cost Per Flying Hour and AFI 65-503), Center for Systems Management, Inc., 2003**
- **Aircraft Support Cost and Budget Estimating Relationships**
- **Measuring Return on Investment for Reliability and Maintainability Investments, SAIC, 2003**

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The Estimating Methodologies for Aircraft and Missile Testing Costs project is to analyze current T&E costs and trends likely to affect them in the immediate future and identify key cost drivers in the testing process, develop CERs and provide documentation.

NAFCOM—This year's effort developed a data access module providing easier searches, exports search results and imports data into CO\$TAT or other statistical packages. This allows for custom CER development using NAFCOM data.

The Automatic Update of AFI 65-503 Using Air Force Total Ownership Cost DB project will evaluate the existing cost factors development processes and provide a series of recommendations on automation of processes.

The Cost Factor Model Support project is a follow-on to and FY01-02 effort. The current automated tool allows easy and expanded query capability of AFI 65-503. This year's effort allows this project to modify the automated tool to capture revisions in AFI 65-503. An on-line WEB enabled database will have capability to extract and query various historical cost factors from the database. Ultimately it will provide an on-line WEB Aircraft Reimbursement Rates. The model will convert AF Cost Per Flying Hour raw data from spreadsheets to a database table and provide adjustments back to 1998.

The Aircraft Support Cost and Budget Estimating Relationships is a follow-on to a 2001 project. It will develop CERs for DLRs, consumable supplies, depot overhauls, maintenance manpower, modification kit acquisition and installation, and software maintenance. Improved flying hour cost factors will be proposed, BOS relations will be estimated and an O&S Handbook will be developed. The impact of aging aircraft will be evaluated.

The Measuring ROI for R&M Investments project developed a query and extraction capability. It will analyze the impact of aging on the item level for reparable and consumables. Mission Design Series unique CERs are being developed to predict the future impact of aging. Further study will quantify the impact of modifications on future O&S cost and assess the achievement of cost avoidance/savings and return on investment.



U.S. AIR FORCE

General Research Projects in Support of Estimating (Cont'd)

- **Aircraft Support Cost and Budget Estimating Relationships, RAND, 2001**
- **Aging Aircraft: Evaluating Solution Directions, Rand**
- **Military Jet Engine Acquisition: Technology Basics and Cost Estimating Methodology, Rand 2003**
- **The Effects of Advanced Materials on Airframe Operating and Support Costs, Rand, 2001**
- **The Cost of Future Military Aircraft: Historical Cost Estimating Relationships and Cost Reduction Initiatives, Rand, 2001**

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Aging Aircraft study is a follow-on to an FY01 research project that delivered parametrics for estimating CPFH aging effects by airframe, avionics and engines. The FY03 effort will expand the parametrics to the Mission/Design/Series (MDS) aircraft and update the study with more recent actual data.

The Military Jet Engine Acquisition: Technology Basics and Cost-Estimating Methodology study updates the last RAND turbine engine study done in the 1980s, capturing advanced made in design and manufacturing processes. New CERs will be developed along with new methodologies for yielding more accurate forecasts of modern engine development and production costs of turbo-fan engines.

Military Jet Engine Acquisition: Technology Basics and Cost-Estimating Methodology study recommends ways to estimate the development schedule and cost as well as production costs of turbo-fan engines. It updates cost studies done from the early 1970's to the early 1980's.

The Effects of Advanced Materials on Airframe O&S Costs study assesses the impact of advanced airframe structure materials versus conventional aluminum. The report recommends means of adjusting O&S costs to accommodate for differences in airframe materials.

The Assessing CRI and ROI on DOD Weapon Systems effort is planning to assess F-22 CRIs to determine Return On Investment (ROI). It will develop a model for “what-if” drills and how it affects ROIs.

D. David Henningsen, DASA(C&E)



Estimating Army Evolutionary Acquisition and Spiral Development Programs

2003 Cost Research Symposium

**ARMY PRESENTER: DAVID HENNINGSEN
22 May 2003**

Outline



- Contributing Organizations
- Major Systems Requiring Cost Estimates
- Changing Costing Requirements
- Future Combat System
- Current Research
- Summary and Conclusions

With a clear vision, we can anticipate future events and plan for them.

The Army's complete transformation into a force that is more strategically responsive and dominant across the entire spectrum of operations includes transforming the Army into an intellectually agile force that organizes and shares knowledge—people, processes, and technology.

Contributing Organizations



- Office of the Deputy Assistant Secretary of the Army for Cost & Economics (ODASA-CE)
- Army Modeling & Simulation Office (AMSO)
- Tank-Automotive and Armaments Command (TACOM)
- Communications & Electronics Command (CECOM)
- Aviation & Missile Command (AMCOM)
- Research, Development and Engineering Command (RDEC)
- Space and Missile Defense Command (SMDC)

Major Systems Requiring Cost Estimates



- Stryker
- High Mobility Artillery Rocket System (HIMARS)
- Family of Medium Tactical Vehicles
- Excalibur - Family of Precision 155mm Projectiles
- Comanche (RAH-66)
- Land Warrior
- Chemical Demilitarization Program (CHEM DMIL)
- Common Missile
- Medium Extended Air Defense System (MEADS)

Major Systems Requiring Cost Estimates *C⁴ISR Systems*



- Force XXI Battle Command Brigade and Below (FBCB2) Program
- Joint Tactical Radio System (JTRS)
- Maneuver Control System (MCS)
- Joint Simulation System (JSIMS)
- Global Command and Control System – Army
- Aerial Common Sensor
- Warfighter Information Network- Tactical (WIN-T)

Major Systems Requiring Cost Estimates *Legacy Systems*



- Blackhawk Upgrade
- Cargo Helicopter Upgrade
- Abrams Upgrade
- Bradley Upgrade
- Longbow Apache

Major Systems Requiring Cost Estimates Future Combat System

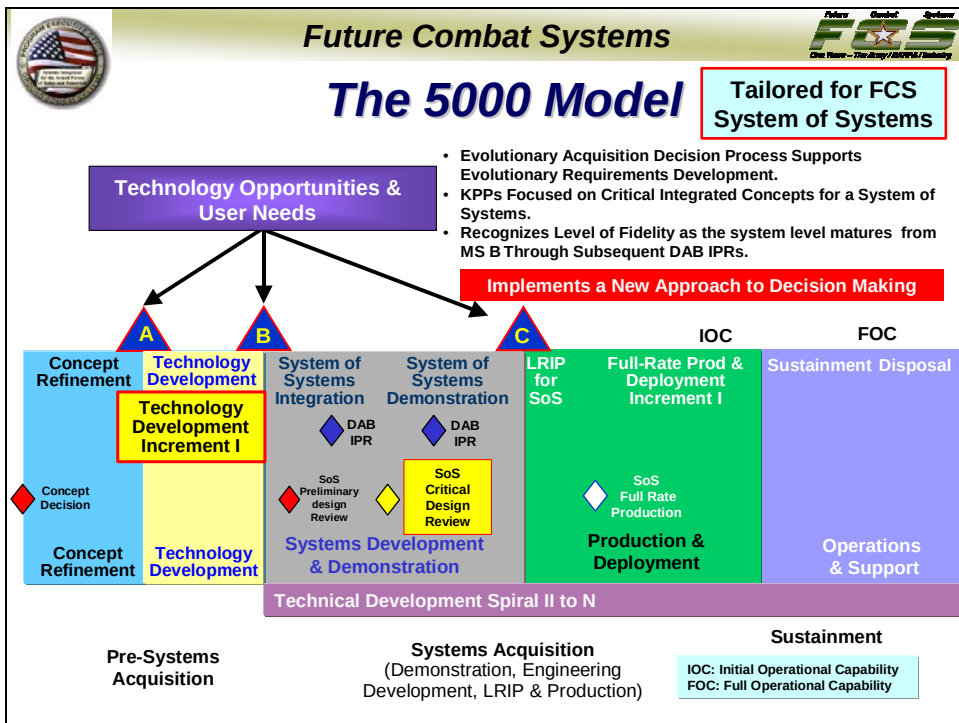
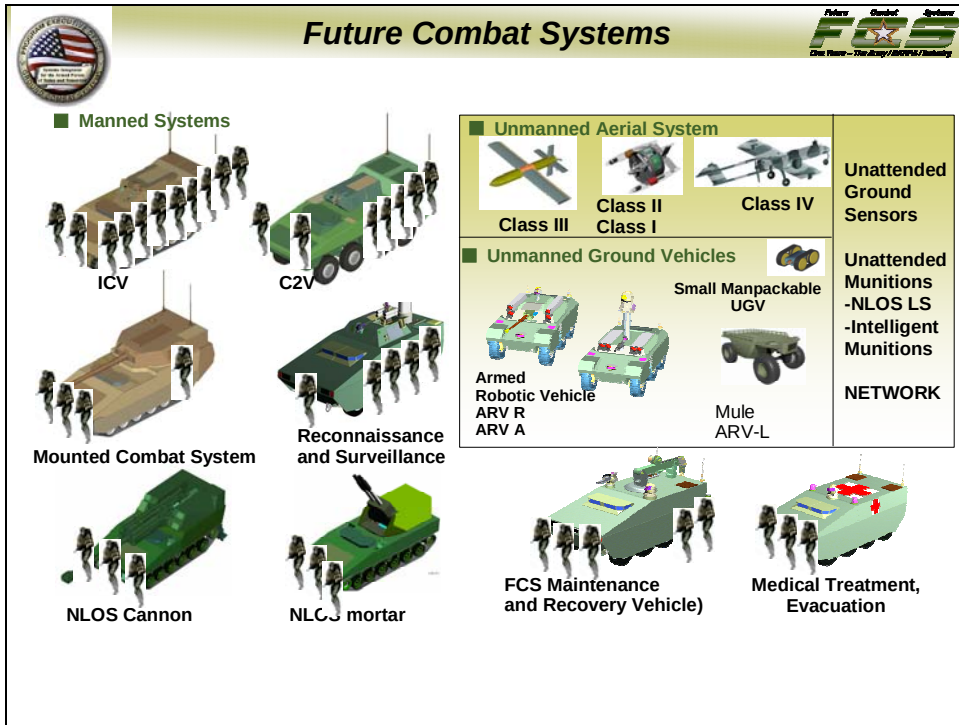


- Future Combat System Vehicles
- Loitering Missiles
- Unattended Ground Sensors
- Unmanned Aerial Vehicle(UAV)
- Unmanned Ground Vehicles (UGV)

Changing Costing Requirements



- Involved costing earlier in the life cycle
- Development schedules shrink from 5-15 years to 2-5 years
- Requirements stated in terms of desired performance and capability
- Programs characterized by limited system and technical descriptions prior to SDD
- Future increments/spirals undefined yet are in POM
- Increment definition changes frequently
- Capabilities developed as modular packages





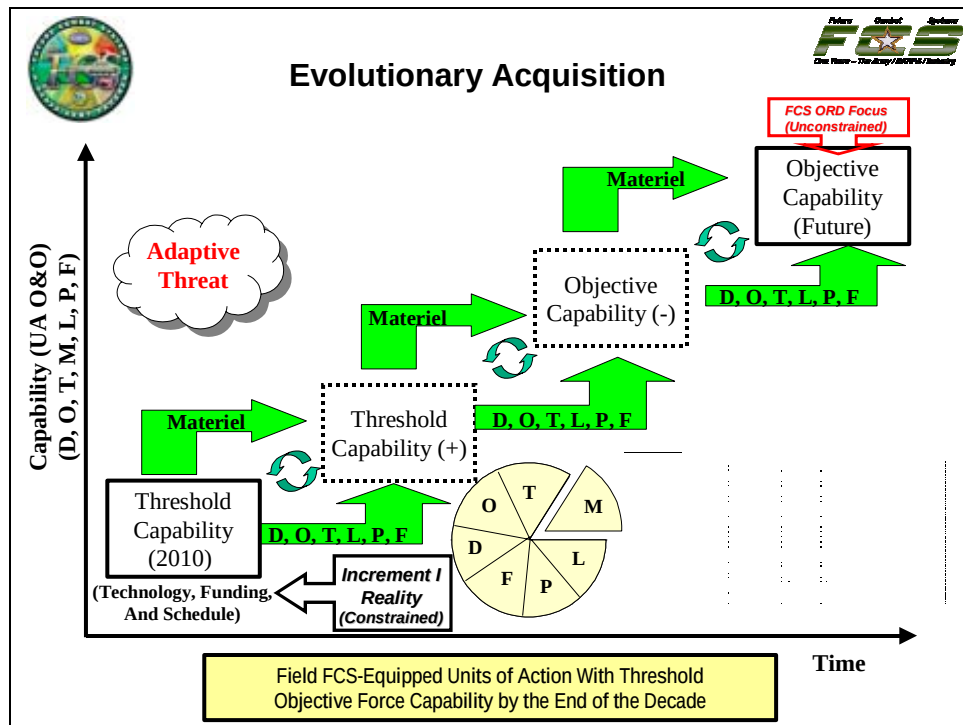
Future Combat Systems



FCS Acquisition Strategy: Spiral vs. Incremental Development

Spiral development is more appropriate for FCS over incremental development because:

- Incremental development assumes that the end-state requirement is known--not true for FCS, despite what many currently think.
- A spiral development process will allow refinement of end-state requirements through:
 - demonstration
 - risk management
 - continuous user feedback
 - technology maturation
- FCS is the perfect test case for new Defense Acquisition guidance
- FCS is blazing trail for Army acquisition because of its “System of Systems” construct



Missiles Systems Research



- Missile Automated Cost Database (ACDB) DASA-CE-6
- Loitering Missile Propulsion Unit Relationships DASA-CE-18
- Turbo-jet and Turbo-fan Propulsion Unit Cost Performance Estimating Relationships DASA-CE-19
- Missile Bluebook DASA-CE-10
- Personnel Costing System DASA-CE-12
- Sensor Data Collection and Cost-Performance Estimating Relationships (CPER) DASA-CE-5
- OSMIS Database and Output Products DASA-CE-1

Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C⁴ISR) Systems Research



- C⁴ISR Automated Cost Database (ACDB) DASA-CE-4
- COTS Electronics Database/Modeling DASA-CE-15
- Sensor Data Collection and Cost-Performance Estimating Relationships (CPER) DASA-CE-5
- C⁴ISR Cost-Performance Estimating Relationships DASA-CE-17
- Personnel Costing System DASA-CE-12
- OSMIS Database and Output Products DASA-CE-1

Vehicle Systems Research



- Wheel and Tracked Vehicle Automated Cost Database (ACDB) DASA-CE-7
- Hybrid Electric Vehicle Cost Performance Estimating Relationships (CPER) DASA-CE-20
- Unmanned Ground Vehicles/Robotics Data Collection and CPER DASA-CE-16
- Personnel Costing System DASA-CE-12
- Sensor Data Collection and Cost-Performance Estimating Relationships (CPER) DASA-CE-5
- OSMIS Database and Output Products DASA-CE-1

Aviation Systems Research



- Aircraft Automated Cost Database (ACDB) DASA-CE-8
- Unmanned Aerial Vehicle Data Collection and CER DASA-CE-14
- Personnel Costing System DASA-CE-12
- Sensor Data Collection and Cost-Performance Estimating Relationships (CPER) DASA-CE-5
- Turbo-jet and Turbo-fan Propulsion Unit Cost Performance Estimating Relationships DASA-CE-19
- OSMIS Database and Output Products DASA-CE-1

Other Research



-
- Force & Contingency Cost Models Update DASA-CE-13
 - Integrated Performance Cost Model (IPCM) DASA-CE-21

Summary and Conclusions



-
- Future costing based on less system definition
 - Future systems costing requires capability based and performance based estimating relationships
 - Current research addressing many of the needs of analysts
 - Automated cost databases (ACDB) and OSMIS must be maintained
 - Future research should address:
 - Risk Analysis
 - Estimating Development Engineering
 - Lower Level Data Collection
 - Additional Cost-Performance Estimating Relationships (CPER)

E. Robert Hiram, NCAD

**Naval Cost Analysis Division
NCAD**

**Cost Estimating Implications of
Evolutionary Acquisition and
Spiral Development**

Cost Research Symposium

Institute for Defense Analysis

May 22, 2003

Robert Hiram NCAD



**Cost Estimating Implications of
Evolutionary Acquisition & Spiral Development**

- Navy Cost Research Community
- Major Navy Programs
- Navy Cost Community View of EA
- Current Navy Cost Research
- EA Concepts and Terms for Cost Estimating
- Navy EA/SD Example
- Lessons Learned



Navy Cost Research Sponsoring & Funding Organizations

- **Naval Cost Analysis Division NCAD (FMB 6)**
 - ASN(FM&C) Office of Budget
 - ACAT 1C independent estimates only
- **NAVSEA**
 - Cost Engineering & Industrial Analysis Div. (SEA-017)
- **NAVAIR**
 - Cost Department (AIR-4.2)
- **Office of Naval Research (ONR)**
- **CAIG, Marine Corps, SPAWAR, ASN(RD&A),
OPNAV, Program Managers**



Analytical & Research Organizations

- **NCAD, NAVSEA, NAVAIR**
- **Field Activities**
 - Naval Surface Warfare Center, Carderock (NSWCCD)
 - Naval Surface Warfare Center, Dahlgren (NSWCDD)
 - NAWCAD – Lakehurst NJ and Pax River MD
 - NAWCWD - China Lake, CA
- **FFRDCs**
- **Navy PG School, Universities**
- **Weapon System & Support Contractors**



Major Navy Programs (EA)

Ships & Systems

- CEC Block II
- CVN(X)
- DD(X)
- Littoral Combat Ship*
- Amphibious Ships
- Virginia Class Sub

Missiles & Other Systems

- AARGM
- AIM-9X upgrade
- Standard Missile
- MIDS
- Advanced Deployable Sys.

Aircraft & Systems

- Active Elec. Scanned Array (F/A-18)
- E-2C Advanced Hawkeye*
- E/A-18G*
- F-35 (JSF)
- H-1 Upgrades
- Multi-mission Maritime A/C (MMA)*
- MH-60
- V-22

AIS Programs

- Navy Tactical Command Supt. Sys.
- Defense Travel System
- Deployable Joint C&C System

* Pre MDAP



Navy Cost Community (SYSCOM) View of EA

- Most cost analysts have had little direct experience with EA
 - Few Navy programs have a formal EA process
 - Don't see a big difference between EA and the old P³I, block upgrade process.
 - Don't see a near-term need for new estimating methods.
- But, more important to understand the program (total and increments) and properly apply traditional costing methods
- Want to see data on EA programs



Status of Current Navy Cost Research

- **Almost all research is continuation of past effort**
 - Reduced resources available
- **Most new cost research will be in support of specific programs**
 - Little funding is dedicated to general cost research
- **Research does not specifically address EA**
 - Analysts not aware of specific need
 - EA cost data not yet available
 - Most research is applicable to both traditional and EA procurement



Current Research on Ships & Ship Systems

- **Effect of New Technologies on Ship System Cost**
- **Marine Composites Affordability**
- **Analysis of Industrial Base for Submarine Components**
- **Analysis of Ship Inflation**
- **Ship Construction Cost Database (ACDB)**
- **Ship Systems Integration Cost Estimating Methods**
- **COTS Procurement Cost Estimating Methodology**



Current Research on Aircraft & A/C Systems

- Cost Growth of Aircraft and Components
- Force Level Economic Effectiveness Trade Model (FLEET)
- Cost Risk Methodology Model
- Avionics, Rotary Wing and Propulsion and Missile Databases
- Environmental Cost of Hazardous Operations
- Installation and Integration Cost Models



EA Concepts and Terms for Costing

DODI 5000.2 - "EA is DoD's preferred strategy for rapid acquisition of mature technology for the user. An evolutionary approach *delivers capability in increments*, recognizing, upfront, the need for future capability improvement."

- Spiral – end-state requirements are not known
- Increment – end-state requirement is known

- First increment is a quick, low-risk, partial solution
- Follow-on increments/spirals have higher risk and less definition
- Each increment will receive a separate MS B and C with cost estimates



Navy EA/SD Example Advanced Deployable System ADS

- Deployable undersea surveillance system
 - SPAWAR SYSCOM
 - Program started in 1992
 - Requirements changed
 - Cost grew
 - Slow progress towards an operational system
 - Original MS II Jan. 2000
 - April 2001 Program Review directed a restructure
 - RDT&E cost growth caused re-designation as ACAT 1C



Advanced Deployable System ADS Restructured

- Restructured as EA program
 - Fit well into the EA model
 - Integrate advanced commercial technology
 - Has multiple configurations
 - Four increments
 - First increment is scheduled for a new MS B type review in Nov 2003
 - Unclear if the MS cost estimate should cover only Increment 1 or the whole program
 - NCAD agreed to estimate Increment 1, assess later increments as resources permit
 - PM schedule shows a MS every year thru 2010



ADS Increments

- **Increment 1 (MS B 2000, 2004)**
 - Well defined requirement, funding, specifications, CARD and other documentation, relatively low risk
 - But, depends of follow-on increments
- **Increments 2-4 (MS B 2005-2007)**
 - Requirements still evolving, higher risk
 - Partially defined, insufficient definition for a CARD
 - Each must mature before its MS B
- **Issues:**
 - Should MS for Increment 1 cover the whole program?
 - Should Increment 1 fund development for follow-on increments or should the PM have separate Technology Development funds?



ADS Increment 1 SDD, Production & Deployment

- **System Design and Demonstration**
 - Well defined for increment 1
 - Support development for follow-on increments?
- **Production**
 - Follow-on increments significantly affect quantities
 - Concurrent quantity
 - Inventory requirement (25% of total program)
 - NCAD will use PM's assumptions
- **Deployment**
 - Program funds O&M for all increments
 - Increment 1 O&M ends when increment 2 development begins
 - Estimate depends on assumptions for all increments



ADS Increment 1 O&S

- **Operating and Support**
 - Operational life is related to follow-on increments
 - Depends on assumptions for all increment
 - Multiple configurations to support
 - Commonality of design between increments critical to cost control (training, logistics).



EA - Cost Lessons Learned

- **Agreement on assumptions for follow-on increments is critical**
 - Costs for early, well-defined increments are driven by assumption for less defined follow-on increments
- **Need to research spiral/repetitive T&E**
 - Cost research needs to address the spiral (build-test-build) approach and higher frequency of T&E events



EA - Other Lessons Learned

- The EA milestone deals with just one increment, but there is interest in the whole program
 - Want to know the risks ahead
 - Inspectors general, comptrollers, congressional staff insist on seeing total program cost
 - Need to defend out-year funding in the POM/PR process
- More milestones increase workload for estimators and other evaluators
- Risk flows downstream

IV. Leasing Defense Systems: UK Experience, Terry Proffitt, PFG/CF

Private Finance Initiative **Some implications for cost analysts**

Presentation to the IDA/CAIG Cost Research Symposium
Washington, May 2003

by

Terry Proffitt

Cost Forecasting Team Leader
Pricing and Forecasting Group
UK Defence Procurement Agency



1



THE AAR NEED

- The Strategic Defence Review highlighted the strategic need for an air-to-air refuelling (AAR) capability for front-line aircraft across a range of defence roles and military tasks to enable:
 - force multiplication
 - operational range enhancement
 - deployment to operational theatres
 - vital support in-theatre
- Air-to-air refuelling capability will remain a fundamental UK need for the foreseeable future

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2



FUTURE STRATEGIC TANKER AIRCRAFT

- The RAF's VC10s have been in service for some 35 years and operate in
 - the Air Transport (AT) role
 - the Air-to-Air Refuelling (AAR) role
- The RAF's TriStar aircraft have been in service for over 20 years and operate in
 - the AT role
 - the AAR role
- It is planned to replace both aircraft types with the Future Strategic Tanker Aircraft (FSTA)

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3



CURRENT STATUS

- The existing operational fleet consists of
 - 19 VC10 aircraft (12 exclusively AAR)
 - 9 TriStar aircraft (3 exclusively AT)
- All the other aircraft are dual-role capable
- The current fleet is reaching the end of its useful life
- Current plans involve its replacement between 2008 and 2012

DPA

4



FSTA PROJECT BACKGROUND

- FSTA is the largest project in the MOD's extensive Private Finance Initiative (PFI) programme
- FSTA programme estimated Whole Life Cost is approximately £13 billion (in Outturn Prices). £2.5 Bn capital cost at 2002 economic conditions
- Timetable:
 - Invitation to Negotiate issued December 2000
 - Two consortia submitted formal bids in July 2001
 - Final bids submitted April 2003
 - PFI Service expected to commence in 2008
 - Full service capability by 2012

DPA

5



AIMS

To identify a Private Finance Initiative solution to:

- Provide primary AAR with some secondary AT (freight and passenger) capability to meet operational needs
- Involve sufficient risk transfer to ensure value for money compared to the best conventional option
- Be attractive to potential suppliers, financiers and insurers

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6



SERVICE TO BE PROVIDED

- For FSTA, the RAF will use the aircraft but the risks of ownership remain with the service provider
- The RAF will continue to retain operational responsibility for all military tasks
- The service provider will own, manage and maintain the aircraft and provide training facilities and some personnel
- MOD will pay for the AAR/AT provision on the basis of availability and usage

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7



SERVICE TO BE PROVIDED

- The service provider will be able to earn extra revenue by using spare aircraft for approved commercial operations
- However, the RAF would always have first call on all the aircraft in an emergency
- Payment will only be made when the service is delivered to a satisfactory standard
- MOD is seeking a service bounded by the maximum number of operational aircraft they can call upon in any one day. The number of aircraft needed may differ between aircraft solutions

DPA

8



SERVICE TO BE PROVIDED

- Likely service provision under the FSTA PFI:
 - Aircraft and spares
 - Special-to-Type Ground Support Equipment
 - Management of Government Furnished Equipment
 - Training of flight crews and other FSTA personnel
 - Engineering and logistic support
 - Sponsored Reserve Air/Ground Crew
 - Fleet management
- The final scope of the service will be based on best value for money

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9



BIDDING CONSORTIA

Two industry consortia are bidding for FSTA:

- **AirTanker Ltd**

Cobham, EADS Airbus, Rolls-Royce and Thales
Solution based on Airbus A330 aircraft

- **The Tanker & Transport Service Company**

BAE Systems, Serco, Spectrum Capital and Boeing
Solution based on Boeing 767 aircraft

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10



POSSIBLE CONTRACT TERMS

- A 27 year contract is expected, to include a
 - specially developed payment mechanism based on availability and usage charges
 - service credit regime to incentivise performance
 - fixed prices for the services to be provided
 - appropriate variation of price condition linked to output based indices
- Opportunities for gainsharing will also be sought

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11



THIRD PARTY INCOME

- The RAF will not need all of the aircraft all of the time so the service provider will be able to earn extra revenue by using spare aircraft for approved commercial operations
- Overriding need for the RAF to have first call on the aircraft in an emergency and oversight of commercial operations for security reasons

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12



THIRD PARTY INCOME

- This will require the aircraft to oscillate between the military register and the civil register
- However, requirements of the civil register are different:
 - no explosives or weapons
 - no AAR
 - military flying quite different from normal civil airliner operation - fatigue life implications

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13



INSURANCE

- Governments normally bear the uninsured losses
- PFI providers will
 - look to the insurer to pay forthwith if aircraft lost or damaged other than for AAR (no commercial insurance cover available for AAR)

INSURANCE

- Usually the Government can decide to
 - rotate existing assets to re-generate the capability
 - or give up some military capability
- However, under PFI the asset is owned by somebody else and there will be a contractual obligation on the Government to pay for its replacement or the servicing of the finance

WHAT HAPPENS IF BULLETS FLY ?

- For FSTA, the RAF will crew the aircraft except when used to earn third-party revenue
- UK law allows for Sponsored Reserves, civilians who have taken on an obligation for military service when called out

LEGAL, ACCOUNTANCY AND OTHER COSTS

- These costs can be significant
 - Legal
 - Accountancy
 - Technical
 - Cost analysis
- PFI bidders also incur significant bid-related costs (including legal, banking and financial market advice)

LEGAL, ACCOUNTANCY AND OTHER COSTS

Some recent UK examples:

- Typically £50M plus for large value defence projects
- For the London Underground PFI a total bill of some £440M for the bidders and for advisors to London Underground

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18



PUBLIC SECTOR COMPARATOR

The Public Sector Comparator (PSC):

- reflects historic public sector practice but permits “Smart acquisition” e.g PFI the Aircrew and groundcrew Training and Whole Life contractor logistic support
- does not assume constraints on public capital

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TAXATION DIFFERENTIAL

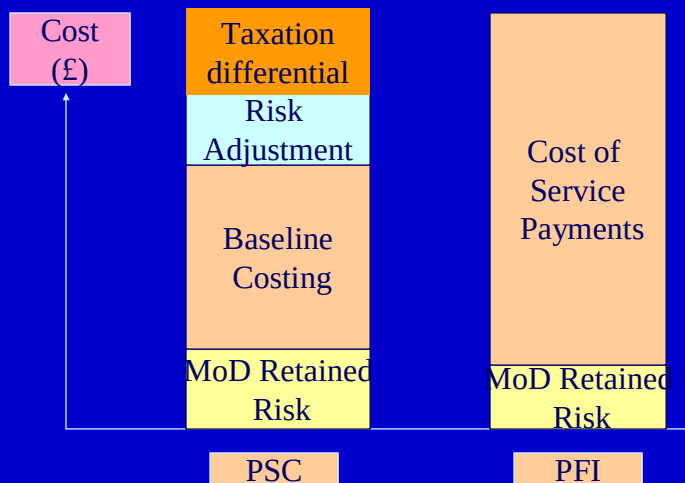
- Essentially, less taxation receipts from the PSC
- Under PFI tax receipts from
 - interest payments to lenders
 - tax receipts from income stream paid to service providers
- UK Treasury says this taxation effect is from 2% to 15% of project costs, depending on whether it is an operating lease or finance lease
- The taxation effect is added to the PSC value before comparing with the PFI bid

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20



PSC AND PFI COMPARISON



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21



OPTIMISM BIAS

- Long history in public sector projects of cost and timescale overruns
- New Treasury Guidelines require an adjustment to the value for optimism bias
- Mott MacDonald study showed up to 200% uplift
- But projects studied included only 2 MoD projects and one was a telecommunications project
- Discussions underway with the Treasury on how best to account for optimism bias in MoD projects
- MoD already has a rigorous scrutiny process

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22



IMPORTANT RISKS IN PFI CONTRACTS

- Risks may occur over the contract life
 - MoD alters its requirements - demand risk
 - Third-party revenue - how much has been assumed by the bidder ?
 - Under performance or non-availability of service - consequences for MoD or the provider
 - Obsolescence/changes in technology - how will the provider cope ?
 - Ownership of the service provider may change
 - Financial health of the service provider may change

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IMPORTANT RISKS IN PFI CONTRACTS

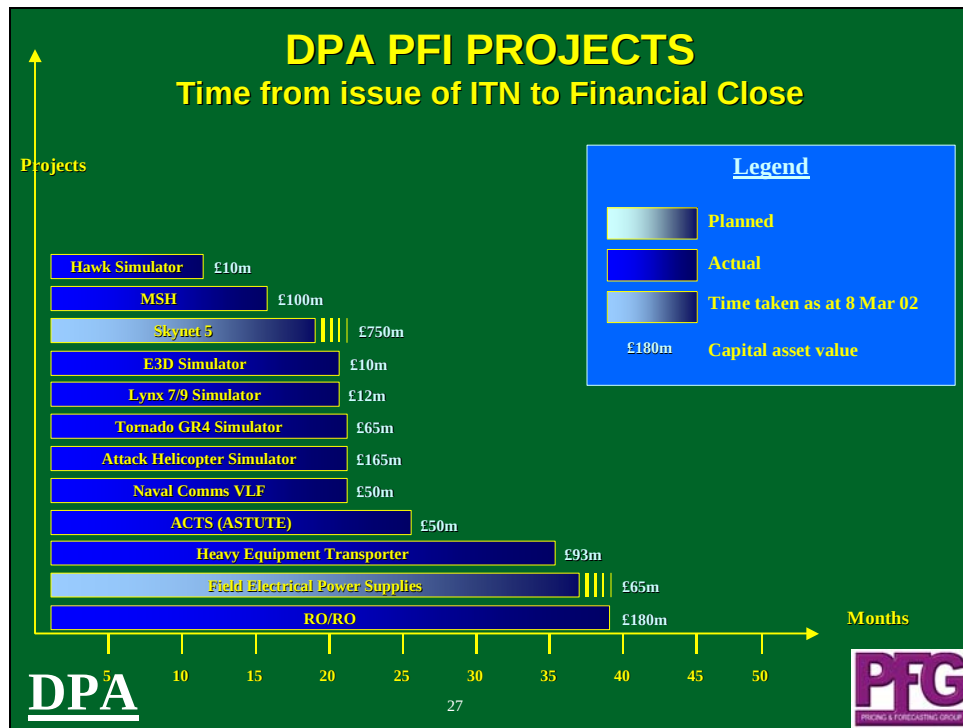
- Risks to be considered
 - Changes in relevant costs - does this damage the provider's business case ?
 - Compensation on early termination - how much ?
 - Length of contract - drives depreciation charges
 - Residual Value - important element of the provider's business case
 - Will specified performance be achieved ?

PERFORMANCE MEASURES

- Define measures of satisfactory performance
 - London Underground even defines what constitutes litter
- Simplify the number of criteria used
 - over 100 formulae in London Underground PFI contract
- Need an exit strategy if service provider fails to live up to his contractual obligations

RESIDUALS

- Define condition in which the aircraft is to be returned to the owner
 - airframe fatigue consumption
 - engine hours used
 - pattern of operation and any limits not to be exceeded
 - zero time the aircraft on return to lessor ?
- All these aspects affect the residual value
- Residual value also affects the leasing charges



Here's the historical precedents on how difficult closing PFIs are.

As a project professional, it is hard to put your hand on heart and say "19 Months, sure, no problem" when even the cheap PFIs are taking 20 months to close. RO/RO the largest so far is £180m; ours is £2.5B

DPA is stepping away from the "Culture of Optimism" and putting their problems on view to the Capability Managers far earlier.

The slip in funding by one year fitted nicely by adding 12 months but we're still very concerned about the effect on Contract Dates and squeezing the Contractor to produce by ITS.

To help us out, the Bidders have been told to produce their final prices on 30 April 03. We've told them Assessment will be based on the info provided on that date. If you aren't able to tell us how and how much, you can lose.

LESSONS LEARNED 1

- Long period from Invitation to Negotiate to financial closure - creates possibilities for the goal posts to be moved
- Need contract flexibility to be able to change the service delivery requirements
- Consider that the service provider may wish to refinance the deal
- Make provision for continuation of service if initial provider goes out of business

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LESSONS LEARNED 2

- Contract length affects the service provider's rate of recovery of his outlay and thus his charges to the user
- Charging rates may be linked to defined annual usage - be careful of implications of exceeding that rate
- Negotiate rights to take over the contract if the initial provider goes out of business
- What happens if the initial provider is taken over ?

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Thank you for listening



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Appendix A.

Study Titles and Keyword Assignments

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 (VAMOSOC) 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	Selected Acquisition Report (SAR) Cost Variance Analysis
PA&E-6	Military Hospital Cost Analysis (Should-Cost Model)
PA&E-7	Methodologies for Estimating Evolutionary Acquisition Programs
PA&E-8	Improved Methodologies for Estimating Development Costs
PA&E-9	IDA Cost Research Symposium
PA&E-10	Next Generation of UAV/UCAV Systems and Platform Cost Estimating
PA&E-11	FYDP Normalization
PA&E-12	Software Metrics and Major Cost Drivers
PA&E-13	Defense Cost and Resource Center (DCARC)
PA&E-14	Economic Drivers of Defense Overhead Costs
PA&E-15	Cost Behavior of C ⁴ I Systems
PA&E-16	Resource Analyst Training Program
PA&E-17	Aircraft Cost Study-Indirect Labor and Material
PA&E-18	Resource Analysis of DoD Central Training
PA&E-19	Plant Specific Overhead and Industrial Utilization Model
PA&E-20	Aircraft Remanufacture, Upgrades, Modifications, SLEPs Database Development
PA&E-21	Costing Research and Student Theses at AFIT and NPS
PA&E-22	Initiation of Cost Estimating

Missile Defense Agency

MDA-1	MDA Cost Risk Methodology Update (Revision 5)
MDA-2	Missile Development Engineering Cost Estimating Relationship
MDA-3	Radar Cost Model
MDA-4	MDA Cost Research Workshop
MDA-5	Estimating Costs of Interoperability as a Countermeasure Solution

MDA-6	Software Analysis of Platform Functionality
MDA-7	Single Integrated Air Picture (SIAP) System Engineer (SE) Interoperability Lessons Learned
MDA-8	Using U.S. Census Data to Estimate Cost, Cost Drivers and Realistic Cost Goals
MDA-9	Schedule Analysis for MDA Programs
MDA-10	Develop Improved Methodologies for Estimating Costs of Space System Payloads

Deputy Assistant Secretary of the Army for Cost and Economic Analysis Center

DASA(C&E)-1	Operating and Support Management Information System (OSMIS) Data Base Management
DASA(C&E)-2	ACEIT Help-Desk/Training
DASA(C&E)-3	ACEIT Enhancements
DASA(C&E)-4	Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C ⁴ ISR) Systems
DASA(C&E)-5	Sensor Cost Estimating Relationship (CER) Development
DASA(C&E)-6	Tri-Service Missile and Smart Munitions Database
DASA(C&E)-7	Wheel and Tracked Vehicle Data Base and Methodology Development
DASA(C&E)-8	Aircraft Module Data Base Development
DASA(C&E)-9	Standard Variable IDs for use in ACEIT
DASA(C&E)-10	Tri-Service Missile and Smart Munitions Database Bluebook Update
DASA(C&E)-11	Standard Service Cost (SSC)
DASA(C&E)-12	Personnel Costing System
DASA(C&E)-13	Force and Contingency Cost Models Update
DASA(C&E)-14	Unmanned Aerial Vehicle Data Collection and CER
DASA(C&E)-15	COTS Electronics Database/Modeling
DASA(C&E)-16	Unmanned Ground Vehicles/Robotics Data Collection and CER
DASA(C&E)-17	C ⁴ ISR Cost-Performance Estimating Relationships
DASA(C&E)-18	Missile Propulsion Cost Performance Estimating Relationships
DASA(C&E)-19	Turbo-jet and Turbo-fan Propulsion Unit Cost Performance Estimating Relationships
DASA(C&E)-20	Hybrid Electric Vehicle Cost Performance Estimating Relationships
DASA(C&E)-21	Integrated Performance Cost Model (IPCM)

Army Materiel Command

No input submitted.

Army Tank-automotive and Armaments Command

TACOM-1	Price Model Calibration—Combat Vehicles
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Army Aviation and Missile Command

No ongoing projects at this time.

Army Space and Strategic Defense Command

SMDC-1	Base Operations Cost Estimating Relationship Development
SMDC-2	Missile Defense Propulsion Cost Research
SMDC-3	THAAD Radar Environmental Quality Life Cycle Cost Estimate (EQLCCE)
SMDC-4	PAC-3 Environmental Quality Life Cycle Cost Estimate (EQLCCE)

Naval Cost Analysis Division

NCAD-1	Ship and Shipboard System Operating and Support Cost Analysis Model (OSCAM-Ship, OSCAM-Sys)
NCAD-2	Aircraft Operating and Support Cost Analysis Model (OSCAM-Air)
NCAD-3	Naval VAMOSC Management Information System
NCAD-4	COTS Shipboard Electronics Cost Factors
NCAD-5	Platform Integration Cost Database/Model for Shipboard Electronics
NCAD-6	Ship Construction Cost Database (SCCD)
NCAD-7	Weapon System Software Development Cost/Technical Database
NCAD-8	Weapon System Software Maintenance Cost/Technical Database and Estimating Methodology
NCCA-9	AIS Life Cycle Cost and Technical Database
NCCA-10	Hardware Deflator 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	Marine Composites Affordability—A Knowledgebased Approach
ONR-5	The Effect of New Technologies on Ship Systems: A System Dynamics Cost Modeling Approach

Naval Air Systems Command

NAVAIR-1	SLAP/SLEP Full Scale Testing Model
NAVAIR-2	Demilitarization/Disposal Model
NAVAIR-3	Cost Growth Analysis
NAVAIR-4	Naval Aircraft Modification Model (NAMM) Update
NAVAIR-5	Force Level Economic Effectiveness Trade (FLEET) Model
NAVAIR-6	Engineering Investigations Cost Model (EICM)
NAVAIR-7	Avionics Database
NAVAIR-8	Rotary Wing Database
NAVAIR-9	Propulsion Database
NAVAIR-10	Environmental Costs of Hazardous Operations (ECHO) Model

NAVAIR-11	Analysis of Alternatives (AOA) Evaluation Tool
NAVAIR-12	Missile Database
NAVAIR-13	Cost Risk Methodology/Model
NAVAIR-14	Software Cost and Schedule Estimating – SBIR (Small Business Innovative Research) N01-020 Phase II
NAVAIR-15	Installation Optimization and ECP/Modification Cost Trade-off Model
NAVAIR-16	Aircraft Integration & Certification Cost Model

Naval Sea Systems Command

NAVSEA-1	Material Vendor Survey
NAVSEA-2	Theater Surface Combatant (TSC) Technology Refresh Cost Model

Naval Surface Warfare Center, Dahlgren Division

NSWCDD-1	Radar Cost Model
NSWCDD-2	Missile Cost Model Version 3.15

Naval Surface Warfare Center, Carderock Division

NSWCCD-1	LEAPS Cost Support, Update
NSWCCD-2	Flexible Tool for Assessing Ship Cost (Flex-TASC)

Air Force Cost Analysis Agency

AFCAA-1	ACE-IT Enhancements
AFCAA-2	Military Aircraft Data and Retrieval (MACDAR) System Update
AFCAA-3	NAFCOM (NASA/Air Force Cost Model)
AFCAA-4	Air Force Total Ownership Cost (AFTOC) Management Information System
AFCAA-5	Air Force Inflation Model Tool
AFCAA-6	Aircraft Avionics Systems Database and Study
AFCAA-7	Performance Activated COTS Electronics Relationships (PACER) (Formerly COTS Electronics Database/Modeling)
AFCAA-8	Cost Factor Model Support
AFCAA-9	Aircraft and Aircraft Modification Sufficiency Review Handbook
AFCAA-10	Long Range Planning Cost Analytical Support
AFCAA-11	Measuring ROI for R&M Investments
AFCAA-12	Automatic Update of AFI 65-503 with AFTOC database
AFCAA-13	Aircraft Software Data Track
AFCAA-14	Ground Satellite System Architecture
AFCAA-15	USCM/PSCM Unmanned Space Cost Model and Passive Sensor Cost Models
AFCAA-16	Assessing Cost Reduction Initiatives and Returns on Investment for DoD Weapon System Programs
AFCAA-17	Develop CPFH Contingency Calibration Factors

AFCAA-18 Firm Fixed Price Contract Study

Aeronautical Systems Center, Air Force Materiel Command

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

Air Force Space and Missile Systems Center

No input submitted.

Electronics Systems Center, Air Force Materiel Command

No input submitted.

Ministry of Defence, Special Procurement Services/Cost Forecasting

No input submitted.

Air Force Institute of Technology

AFIT/ENV-1	Analysis of Airborne and Ground Based Electronics Systems Cost Growth and Acquisition Reform Cost Initiatives
AFIT/ENV-2	Assessing Cost Risk Using Historical Cost Variance Data
AFIT/ENV-3	A Model for Reducing Petroleum Consumption (RPC) on Air Force Installations
AFIT/ENV-4	A model for Implementing the Usage of Alternative Fueled Vehicles on Air Force Installations
AFIT/ENV-5	Analysis of Tactical and Strategic Missile Systems Cost Growth and Acquisition Reform Cost Initiatives

Defense Systems Management College

No input submitted.

Aerospace Corporation

AEROSPACE-1	Space Systems Costing Suite
AEROSPACE-2	Costs of Space, Launch, and Ground Systems
AEROSPACE-3	Terrestrial Component Architecture and Cost Module (TCACM)
AEROSPACE-4	The Aerospace Corporation Small Satellite Cost Model (SSCM)

MITRE Corporation

No input submitted.

RAND Corporation

RAND-1	Software Cost Estimation and Sizing Methods, Issues, and Guidelines
RAND-2	The Impact of Price Based Acquisition on DoD Programs
RAND-3	F/A-22 and F/A-18 E/F Engineering/Manufacturing Development Case Studies: Lessons Learned

RAND-4	Aircraft Support Cost Estimating Relationships
RAND-5	Analysis of Cost Growth using Selected Acquisition Reports
RAND-6	Analysis of Systems Engineering/Program Management Costs
RAND-7	Developing a Space Systems Sufficiency Review Handbook

CNA Corporation

CNAC-1	Program Manager Education
CNAC-2	Financial Health of Defense Contractors
CNAC-3	Military Hospital Cost Analysis — Phase II
CNAC-4	Improving Acquisition Metrics
CNAC-5	Inventory and Assessment of Models for Navy PPBS
CNAC-6	Commercial and Navy Acquisition Practices

Institute for Defense Analyses

IDA-1	Assessment of Contractor Cost Data Reporting (CCDR) and Software Resource Data Report (SRDR) Systems
IDA-2	O&M Program Balance & Related Cost Drivers
IDA-3	Ballistic Missile Technical Collection Analysis of Alternatives
IDA-4	Major Defense Acquisition Program (MDAP) Analysis and FYDP Support
IDA-5	FYDP Viewers Upgrade
IDA-6	Economic Drivers of Defense Overhead Costs
IDA-7	DOD Semiconductor Foundry
IDA-8	JASSM
IDA-9	DSCA Business Metrics
IDA-10	Contingency Operations Support Tool (COST)
IDA-11	Army Enlistment Early Warning System
IDA-12	Methods to Assess Schedules for the Strategic Defense System
IDA-13	Costs of Developing and Producing Next Generation Tactical Aircraft
IDA-14	Support Labor Cost For Military Aircraft
IDA-15	Developing a Life Cycle Cost Model and Conducting a Cost Analysis of the Advanced Multifunction RF-Concept (AMRF-C)
IDA-16	Force Modernization Metrics
IDA-17	Active/Reserve Integration
IDA-18	Reducing Defense Infrastructure Costs
IDA-19	Management Headquarters Analysis
IDA-20	Training Transformation Funding and Requirements Validation Study
IDA-21	Consolidation of Defense Agency Overhead Functions
IDA-22	Total Manpower Cost of Military Personnel
IDA-23	Workload Forecasting for the Veterans Benefits Administration
IDA-24	Future Low Acquisition Cost Tactical Missiles
IDA-25	Evaluation of TRICARE Program Costs

IDA-26	Resource Analysis for Operational Test and Evaluation (OT&E)
IDA-27	Resource Analysis for Test and Evaluation—MRTFB
IDA-28	Support to SBR independent Cost Assessment
IDA-29	FYDP Related Studies
IDA-30	FYDP Improvement, Phase II
IDA-31	Assistance to OSD PA&E Independent Cost Estimate of the Pentagon Renovation
IDA-32	Portfolio Optimization Feasibility Study
IDA-33	Defense Resource Management Cost Model
IDA-34	Analytical Support for the Test and Evaluation Science and Technology (TEST) Program
IDA-35	Resource Analysis for T&E - CTEIP
IDA-36	Industrial Sector Capability Analysis
IDA-37	Cooperation with KIDA
IDA-38	Cost Analysis Education
IDA-39	Cooperation with MinDef, Singapore
IDA-40	Improving Defense Resource Management

Table A-1. Keyword Assignments

	PA&E	MDA	DADA-CE	AMCRM	TACOM	AMCOM	SMDC	NCCA	ONR	NAVAIR	NAVSEA	NSWCDD	NSWCDD	AFCAA	ASC/FMC	AFSMC	ESC/FMC	PFG/CF	AFIT/ENV	DSMC	AERO	MITRE	RAND	CNAC	IDA	Total
PERSPECTIVE																										
Industry	6	—	3	—	—	—	3	1	4	—	1	—	—	5	1	—	—	—	—	—	1	2	1	1	3	32
Government	22	9	17	—	—	—	3	10	4	5	1	2	2	18	1	—	—	—	5	—	1	—	7	4	29	140
CONTEXT																										
Estimating	18	5	19	—	1	—	4	8	4	5	2	2	2	13	1	—	—	—	—	—	2	1	2	—	13	102
Analysis	4	8	10	—	—	—	—	3	—	9	—	—	—	16	1	—	—	—	5	—	—	—	3	—	19	78
Reviewing/Monitoring	4	—	—	—	—	—	—	—	—	—	—	—	—	2	1	—	—	—	—	—	—	—	—	3	3	13
Policy	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	1	—	13	16
Programming	3	—	2	—	—	—	—	—	—	—	—	—	—	4	—	—	—	—	—	—	1	—	—	1	8	19
Budgeting	1	—	2	—	—	—	1	—	—	—	1	—	—	2	—	—	—	—	—	—	1	—	—	1	5	13
OBJECT																										
Forces	5	—	1	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	1	—	—	—	5	14
Weapon Systems	4	2	3	—	—	—	—	1	—	1	1	—	—	8	1	—	—	—	3	—	—	—	3	2	2	31
Aircraft	1	—	1	—	—	—	—	1	—	8	—	—	—	6	—	—	—	—	—	—	—	—	2	—	3	22
Helicopters	—	—	1	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	3
Missiles	—	1	3	—	—	—	3	—	—	1	—	1	—	4	—	—	—	—	—	—	—	—	—	—	4	17
Ships	—	—	—	—	—	—	—	4	4	—	2	—	2	—	—	—	—	—	—	—	—	—	—	—	—	12
Land Vehicles	—	—	3	—	1	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	6
Space Systems	—	—	—	—	—	—	—	—	—	—	—	—	—	3	—	—	—	—	—	—	3	—	1	—	2	9
Airframe	—	—	—	—	—	—	—	—	—	—	—	—	—	3	—	—	—	—	—	—	—	—	—	—	—	3
Propulsion	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1	2
Electronics/Avionics	3	—	3	—	—	—	—	1	—	2	1	—	—	4	—	—	—	—	—	—	—	—	—	—	2	16
Spares/Logistics	—	—	—	—	—	—	—	—	—	—	—	—	—	3	—	—	—	—	—	—	—	—	—	—	—	3
Facilities	3	—	1	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	4	9
Infrastructure	1	—	1	—	—	—	1	—	—	—	—	—	—	2	—	—	—	—	—	—	—	2	—	—	8	14
Manpower/Personnel	—	—	1	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	6	8
STAGE																										
C&TD	—	—	9	—	—	—	—	—	4	—	—	—	—	—	—	—	—	—	—	—	1	2	1	—	—	17
SD&D	2	—	10	—	—	—	1	—	—	1	1	2	—	5	—	—	—	—	1	—	1	—	—	1	4	29
Production	—	—	12	—	—	—	—	3	2	1	1	2	—	6	—	—	—	—	1	—	—	—	1	1	7	37
Test and Evaluation	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5	5
Operations and Support	—	1	3	—	—	—	1	5	3	—	1	—	—	4	—	—	—	—	—	—	—	—	1	—	3	21
Retirement and Demilitarization	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0
Life Cycle	2	2	4	—	1	—	2	2	3	1	—	—	—	9	—	—	—	—	4	—	1	—	—	—	5	36

(Continued on the next page.)

Table A-1—Continued

	PA&E	MDA	DADA-CE	AMCRM	TACOM	AMCOM	SMDC	NCCA	ONR	NAVAIR	NAVSEA	NSWCDD	NSWCDD	AFCAA	ASC/FMC	AFSMC	ESC/FMC	PFG/CF	AFT/ENV	DSMC	AERO	MITRE	RAND	CNAC	IDA	Total	
FOCUS																											
Labor	3	—	6	—	—	—	—	—	—	—	1	—	—	3	—	—	—	—	—	—	—	—	—	—	3	16	
Material	3	—	4	—	—	—	—	—	1	—	2	—	—	3	—	—	—	—	—	—	—	—	—	—	1	2	16
Overhead/Indirect	8	—	5	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	6	20	
Engineering	1	—	4	—	—	—	—	—	—	—	1	—	—	2	—	—	—	—	1	—	—	—	—	—	—	9	
Manufacturing	—	1	9	—	—	—	—	1	—	—	—	—	—	3	—	—	—	—	—	—	—	—	—	—	2	15	
CPR/CCDR	—	—	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	6	
WBS	—	2	7	—	—	—	—	1	—	—	1	—	—	2	—	—	—	—	—	—	—	—	—	—	—	11	
Fixed Costs	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	2	3	
Variable Costs	—	—	—	—	—	—	—	—	—	—	—	—	—	3	—	—	—	—	—	—	—	—	—	—	3	6	
Production Rate	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	
Acquisition Strategy	1	—	—	—	—	—	—	—	—	—	1	—	—	1	—	—	—	—	—	—	1	—	1	1	6	11	
Automation	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	
Advanced Technology	—	—	2	—	—	—	1	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	5	
Risk/Uncertainty	—	1	—	—	—	—	—	1	4	1	1	—	—	4	—	—	—	—	—	—	1	—	—	—	—	12	
Training	4	—	1	—	—	—	—	—	—	—	—	—	—	3	—	—	—	—	—	—	—	—	—	1	1	6	
Readiness	—	—	1	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1	3	
Reliability	—	—	1	—	—	—	—	—	2	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	4	
Sustainability	—	—	—	—	—	—	—	2	—	—	1	—	—	5	—	—	—	—	2	—	—	—	—	—	—	10	
Integration	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	
Modification	1	—	—	—	—	—	—	2	—	—	1	—	—	3	—	—	—	—	—	—	—	—	—	—	—	6	
Security	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	
Environment	—	—	—	—	—	—	2	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	
Schedule	2	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	1	—	—	—	2	7	
Size	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Software	2	3	—	—	—	—	—	2	—	1	—	—	—	1	—	—	—	—	—	—	1	—	1	—	2	13	
APPROACH																											
Data Collection	1	—	14	—	—	—	4	7	4	9	1	2	—	15	—	—	—	—	2	—	1	2	—	—	11	73	
Survey	—	—	1	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	2	1	—	—	2	8	
Case Study	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	2	1	—	—	4	9	
Mathematical Modeling	—	1	10	—	—	—	—	2	—	—	—	—	—	8	—	—	—	—	1	—	2	—	—	1	9	34	
Economic Analysis	2	—	—	—	1	—	—	—	—	1	1	—	—	—	—	—	—	—	2	—	—	—	—	1	6	14	
Cost/Production Function	—	—	2	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1	2	6	
Time Series	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1	2	
Statistics/Regression	—	—	3	—	—	—	2	4	—	—	—	—	—	11	—	—	—	—	1	—	1	—	—	1	4	27	

(Continued on the next page.)

Table A-1—Continued

	PA&E	MDA	DADA-CE	AMCRM	TACOM	AMCOM	SMDC	NCCA	ONR	NAVAIR	NAVSEA	NSWCDD	NSWCDD	AFCAA	ASC/EMC	AFSMC	ESC/EMC	PFG/CF	AFT/ENV	DSMC	AERO	MITRE	RAND	CNAC	IDA	Total
PRODUCT																										
Database	2	—	12	—	—	—	2	10	—	6	1	—	—	16	—	—	—	—	—	—	—	—	—	2	8	59
Review	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	3	—	2	8
Method	2	—	—	—	—	—	—	2	—	3	—	—	—	6	—	—	—	—	—	—	2	—	—	—	4	17
Mathematical Model	1	—	1	—	—	—	—	—	—	6	—	2	2	1	—	—	—	—	—	—	—	—	—	—	1	14
Computer Model	1	1	6	—	—	—	—	—	—	—	1	—	—	7	—	—	—	—	—	—	2	1	—	—	7	26
Expert System	—	—	—	—	—	—	—	—	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4
Cost Progress Curve	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	2	—	—	—	—	—	—	3
CER	—	—	4	—	—	—	2	4	—	2	—	2	—	10	—	—	—	—	—	—	2	—	1	—	—	27
Study	13	—	—	—	—	—	2	2	—	2	—	—	—	3	—	—	—	—	—	—	—	3	6	16	47	

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. Richard P. Burke, (703) 695-0721		
Size:	Professional:	50	
	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. In FY 03 the contractor will assess options for web-basing these models, make modifications as necessary to improve accuracy and functionality of the models and determine the feasibility of adding computations for reserve component scenarios.		
Classification:	Unclassified		
Sponsor:	OSD(PA&E)		
	FICAD		
	The Pentagon, Room BE798		
	Washington, DC 20301		
Performer:	CDR Matt Feely, (703) 697-6393		
	UNISYS		
Resources:	<u>EY</u>	<u>Dollars</u>	<u>Staff-years</u>
	1996	\$170,000	
	1997	\$200,000	
	1998	\$275,000	
	1999	\$365,000	
	2000	\$375,000	
	2001	\$385,000	
	2002	\$300,000	
	2003	\$300,000	

Schedule: Start End
Ongoing

Database: None

Publications: TBD

Keywords: Government, Estimating, Forces, 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 website 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:

<u>EY</u>	<u>Dollars</u>	<u>Staff-years</u>
1996	\$275,000	
1997	\$150,000	
1998	\$170,000	
1999	\$170,000	
2000	\$200,000	
2001	\$200,000	
2002	\$200,000	
2003	\$170,000	

Schedule: Start End
Ongoing

Database: 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 (BOS)/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:

<u>EY</u>	<u>Dollars</u>	<u>Staff-years</u>
2000	\$230,000	
2001	\$200,000	
2002	\$350,000	
2003	\$150,000	

Schedule: Start End
Ongoing

Database: 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 provides access to data necessary to assess and validate component planning, programming, and budgeting input as well as facilitate force and infrastructure analyses. FAD links installation RPM/BOS, personnel, and weapon systems inventory data. The FAD model 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), Installations Support Cost Model (ISCM), and the Force and Support Cost (FSC) System. The goals of the current phase are to expand missing data elements for the period FY1989-2001, analyze the data needs of current users and expand the warehouse to capture FY2002 data.

Classification: Unclassified

Sponsor: OSD(PA&E)
The Pentagon, Rm. BE798
Washington, DC 20301
Keith Kaspersen, (703) 695-7710

Performer: UNISYS

Resources:

<u>EY</u>	<u>Dollars</u>	<u>Staff-years</u>
1999	\$250,000	
2000	\$250,000	
2001	\$250,000	
2002	\$200,000	
2003	\$150,000	

Schedule: Start End
Ongoing

Database: None

Publications: None

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

PA&E-5

Title: Selected Acquisition Report (SAR) Cost Variance Analysis

Summary: The project provides 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 continue to gather and 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, provided by the project sponsor.

Classification: Unclassified

Sponsor: OSD(PA&E)
PFED
The Pentagon, Room BE-798
Washington, DC 20301
John McCrillis, (703) 697-2982

Performer: NAVSHIPSO

Resources:

<i>EY</i>	<i>Dollars</i>	<i>Staff-years</i>
2000	\$215,000	
2001	\$215,000	
2002	\$211,000	
2003	\$220,000	

Schedule:

<i>Start</i>	<i>End</i>
Ongoing	

Database:

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: TBD

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

PA&E-6

Title: Military Hospital Cost Analysis (Should-Cost Model)

Summary: The defense health program (DHP) has asked for upwards of \$3 billion in funding above their fiscal guidance in each of the last three program reviews. Discussion of these requests has been unsatisfactory because we lack the tools to establish a “should cost” estimate of requirements for this program. It is imperative that we develop tools to illuminate decisions on a program that is commanding an increasing proportion and amount of the DoD topline. This effort will leverage work already performed by IDA to increase understanding and ability to programs medical resources as effectively as

possible. Effort will produce a model, including identification of variables and data sources, literature search, and summary of past work.

Classification: Unclassified

Sponsors: OSD(PA&E)
EMAD
The Pentagon, Room BE829
Washington, DC 20301
Dr. Jerry Pannullo (703) 692-8049

Performer: CNAC

Resources: *EY* *Dollars* *Staff-years*
2002 \$225,000
2003 \$225,000

Schedule: *Start* *End*
Jan 2002 Sep 2003

Database: None

Publications: None

Keywords: Government, Estimating, Infrastructure, Mathematical Model

PA&E-7

Title: Methodologies for Estimating Evolutionary Acquisition Programs

Summary: This project is a new study to advance the state-of-the-art in weapon system costing. As a new study, a significant portion of this effort will be to identify what techniques, data, and methodologies are applicable to this new approach to the acquisition of weapons systems. These approaches will be demonstrated on programs currently using evolutionary acquisition.

Classification: Unclassified

Sponsors: OSD(PA&E) (NCCA is co-sponsor)
OAPPD
The Pentagon, Room BE829
Washington, DC 20301
Mr. Steve Miller (703) 697-5056

Performer: FFRDC—TBD

Resources: *EY* *Dollars* *Staff-years*
2003 \$250,000

Schedule: *Start* *End*
May 2003 Sep 2004

Database: *Title:* Methodologies for Estimating Evolutionary Acquisition Programs
Description:
Automation:

Publications: None

Keywords: Government, Estimating, Weapon Systems, Acquisition Strategy, Method

PA&E-8

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. A new tool, Generalized Activity Network System (GANS) was developed and used on a missile defense program development phase. Research will continue to in software development activities.

Classification: Unclassified

Sponsors: OSD(PA&E) OAPPD
The Pentagon, Room BE829
Washington, DC 20301
Steve Miller (703) 697-5056

Performer: LMI

Resources:

<u>EY</u>	<u>Dollars</u>	<u>Staff-years</u>
2001	\$100,000	
2002	\$200,000	
2003	\$200,000	

Schedule:

<u>Start</u>	<u>End</u>
Mar 2001	Sep 2003

Database: None

Publications: None

Keywords: Government, Estimating, Weapon Systems, SD&D, Study

PA&E-9

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 2003 Symposium will focus on the status of the Military Departments' capabilities to estimate the costs of evolutionary acquisition and spiral development 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
OSD(PA&E)
The Pentagon, Room BE779
Washington, DC 20301
Russ Vogel (703) 695-2612

Performer: IDA
Dr. Stephen J. Balut, (703) 845-2527

Resources: *EY* *Dollars* *Staff-years*
2000 \$30,000 (PA&E share)
2001 \$30,000 (PA&E share)
2002 \$30,000 (PA&E share)
2003 \$30,000 (PA&E share)

Schedule: *Start* *End*
Oct 2002 Sep 2003

Database: *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: “2003 IDA Cost Research Symposium: Cost of Evolutionary Acquisition/Spiral Development,” Stephen J. Balut, Lynn C. Davis, David W. Henningsen, Robert Hirama, Terry Proffit, Russell A. Vogel, and Jan Young, Document D-2872, Unclassified, August 2003.

Keywords: Government, Reviewing/Monitoring, Forces, Weapon Systems, Life Cycle, Data Collection, Data Base

PA&E-10

Title: Next Generation of UAV/UCAV Systems and Platform Cost Estimating

Summary: Unmanned Air Vehicles (UAVs) and Uninhabited Combat Air Vehicles (UCAVs) are being used and considered to fulfill a growing number of military missions. As these systems are proposed the costs are a factor in the decision process. Unfortunately very little data and tools are available to deal with the modern versions of these systems. The Next Generation UAV/UCAV study will provide the tools necessary to determine the life-cycle cost of these systems.

The study will begin with the development of a taxonomy for the collection of data and development of cost estimating tools for UAV/UCAV. Data will be collected on existing systems to include but not limited to: Hunter, Shadow, VTUAV, Pioneer, Predator, Global Hawk, UCAV-AF, and UCAV-N. A model or models will be developed using the taxonomy and data to estimate the cost for future systems.

The objective of this task is to develop an approach and comprehensive process to estimate the life cycle cost of the next generation UAV and UCAV systems.

Classification: Unclassified

Sponsor: OSD(PA&E)
WSCAD
The Pentagon, Room BE779
Washington, DC 20301
Gary Pennett, (703) 697-7282

Performer: IDA

Resources: *EY* *Dollars* *Staff-years*
2002 100,000
2003 250,000

Schedule: Start End
 May 2002 Sep 2003

Database: TBD

Publications: None

Keywords: Government, Estimating, Analysis, Aircraft, Life Cycle, SD&D, Material, Engineering, Method

PA&E-11

Title: FYDP Normalization

Summary: The department is required to report to Congress on its allocation of fiscal and manpower resources to missions and infrastructure activities. In addition, the Resource Analysis directorate is frequently called upon to develop independent estimates of O&M requirements and to assess O&M estimates developed by the military departments. This project directly supports these and other requirements. The project will study the policy and manpower accounting changes implemented each fiscal year in the budget and prepare the program element and appropriation data changes needed to normalize the prior years of the FYDP relative to the current years. The study will also extend the policy and manpower accounting changes to normalize budget displays of the O&M data based on budget activity, activity group and sub-activity group categorizations. A simple analytical computer-based tool will be built to detect instances where data are internally inconsistent.

Classification: Unclassified

Sponsor: OD(PA&E), FICAD
 The Pentagon, Rm. BE779
 Washington, DC 20301
 Walt Cooper, (703) 697-4312

Performer: FFRDC

Resources: FY Dollars Staff-years
 2002 \$250,000
 2003 \$200,000

Schedule: Start End
 Ongoing

Database: None

Publications: None

Keywords: Government, Industry, Analysis, Labor, Budgeting, Study

PA&E-12

Title: Software Metrics and Major Cost Drivers

Summary: Over the last several years, defense systems have become increasingly dependent on software. All too frequently, the cost and schedule performance of these systems has suffered because of problems associated with critical software components. Defense analysts continue to attempt to project the cost and schedule of such projects with little or no historical experience. Actual costs and metrics of similar completed software efforts for both embedded weapon systems and Major Automated Information Systems (MAIS) programs are needed to properly estimate future program costs. To address this issue, PA&E launched an effort during FY2000 to develop a set of software metrics that ought

to be collected for these projects. A small set of core data was identified, a data collection process was proposed, and a pilot project were initiated. This study would assess the extent to which the targeted metrics “explain” the actual effort/cost of software projects as predicted by five commercial software-estimating tools. The study would also assess the extent to which software defect density data predicts post-deployment software effort and costs. The results of this study would be used to modify the proposed software metrics. The study would assess the proposed software metric collection process with particular attention given to the cost associated with collecting such data. The study would recommend improvements to process.

This study will collect the proposed software metrics data from 10 MDAP and MAIS projects. The researcher will assess the data collection process as well as the extent to which tailoring is needed to obtain the desired data set. The researcher will assess how much effort is required by the developer to provide these data. The researcher will use these data to estimate the cost and schedules of the programs using five commercial software-estimating tools and then compare the results to actuals. This will allow the researcher to assess the extent to which the identified metrics predicts costs and schedules.

The researcher will also collect software defect density data (at time of project completion) and determine whether this metric is a “good predictor” of post-deployment software maintenance efforts.

Classification: Unclassified

Sponsor: OD(PA&E), WSCAD
The Pentagon, Rm. BE779
Washington, DC 20301
Tom Coonce, (703) 697-3845

Performer: IDA

Resources:	<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
	2002	\$136,000	
	2003	\$250,000	

Schedule:	<u>Start</u>	<u>End</u>
	Oct 2001	Sep 2003

Database: None

Publications: None

Keywords: Government, Industry, Analysis, Software, Schedule, Study

PA&E-13

Title: Defense Cost and Resource Center (DCARC)

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.

This project will develop and maintain an Internet-based, secure document and data retrieval system that incorporates CCDR data, cost research libraries, system

performance data, as well as interfaces with other cost-related data systems. Access to the system will be available to authorized users through the World Wide Web. The project will maintain and update software, provide a user-friendly, common search functionality for both electronic data and electronically stored documents, provide help desk support, scan documents into the system, develop both classroom and computer-based training programs for use of and access to the data, and continue its ongoing assessment of user needs and system streamlining requirements. The DCARC will also assist acquisition program offices in developing data collection plans and make assessments and change recommendations on DoD policy affecting cost data collection and develop a data availability assessment tool to assist cost estimators in using cost data for estimating purposes.

Classification: Unclassified

Sponsor: OSD(PA&E)
WSCAD/CCDR-PO
Suite 500, CGN
Arlington, VA
Mr. Ron Lile (703) 602-3169

Performer: IDA, VGS, Tecolote, CMS, MCR Federal

Resources:	<u>EY</u>	<u>Dollars</u>	<u>Staff-years</u>
	2002	\$1,800,000	
	2003	\$2,385,000	

Schedule:	<u>Start</u>	<u>End</u>
	Oct 1996	Sep 2003

Database: Not applicable

Publications: None

Keywords: Government, Industry, Analysis, Labor, Material, Schedule, Study, Overhead/Indirect, Economic Analysis

PA&E-14

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: OSD(PA&E)
The Pentagon, Rm. BE779
Washington, DC 20301
Mr. Gary Pennett, (703) 695-7282

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

Resources:	<u>EY</u>	<u>Dollars</u>	<u>Staff-years</u>
	1995	\$250,000	
	1996	\$250,000	
	2000	\$175,000	
	2002	\$100,000	
	2003	\$125,000	
Schedule:	<u>Start</u>	<u>End</u>	
	Apr 95	Sep 2003	
Database:	<u>Title:</u>	IDA's Defense Contractor Overhead Data Base, Contractor Cost Data Reports	
	<u>Description:</u>		
	<u>Automation:</u>	Incorporating data into an automated database.	
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		

PA&E-15

Title:	Cost Behavior of C ⁴ I Systems
Summary:	The DoD is currently unable to accurately estimate the cost of highly-aggregated, software-intensive C⁴I systems. These systems comprise a significant and rapidly-growing share of DoD investment and support resources. This research will obtain data from completed and ongoing C⁴I development/integration programs to develop cost estimation databases and methodologies to enable analysts to more accurately estimate costs for this commodity class. A recent multi-service/agency C⁴I cost analysis working group identified the lack of adequate data and cost estimating methodologies as key deficiencies in the services'/agencies' ability to adequately estimate the cost of software-intensive C⁴I systems. The working group requested OSD to take a leadership role in addressing these deficiencies. Current software cost estimating techniques are inadequate to estimate the cost of highly aggregated C⁴I systems, where a majority of cost and risk occur in the integration of functional software modules. Ongoing programs routinely incur dramatic cost growth, which results in impaired program execution, delayed delivery of capability to the warfighter, and chronic resource allocation issues. The ability to more accurately predict the cost of these vital systems would provide greater program stability, and would enable resource managers to make informed resource allocation decisions. Accurate cost estimates would enable programs to execute more efficiently with appropriate resources allocated at the outset. The OSD/PA&E (CAIG) software metrics initiative has developed a prototype data collection instrument which is undergoing pilot testing on a limited basis. The proposed research effort would expand data collection by using this instrument on several ongoing development/integration programs, beginning with the Army Battle Command System (ABCS), and constituent systems (Maneuver Control System (MCS) and Force XXI Battle Command, Brigade and Below (FBCB2)). Other programs, such as the Navy's Cooperative Engagement Capability (CEC) would be included as resources/opportunities allow. The collected data will be aggregated with other relevant data collected by the Service Cost Centers, made available through an ongoing initiative by the C⁴I cost analysis working group. These data would be normalized and analyzed to develop cost estimating relationships.

Classification: Unclassified/Company Proprietary

Sponsor: OSD(PA&E)
The Pentagon, Rm. BE779
Washington, DC 20301
Mr. Gary Pennett, (703) 695-7282

Performer: IDA

Resources: EY Dollars Staff-years
2002 \$150,000
2003 \$250,000

Schedule: Start End
Jun 2002 Sep 2003

Database: None

Publications: None

Keywords: Industry, Government, Estimating, Software, Study

PA&E-16

Title: Resource Analyst Training Program

Summary: Analysts assigned to the Office of the Secretary of Defense (OSD) Program Analysis and Evaluation and Cost Analysis Improvement Group (CAIG) often have only a limited background in the business practices of the Secretariat. Some newly assigned analysts come from technical and operational backgrounds with only minimal cost and resource analysis experience. Providing new analysts with a practical overview of the role of the OSD and the CAIG in resource management processes such as the Planning Programming and Budgeting (PPBS) and acquisition process would significantly reduce the time it takes them to become productive members of the staff. Few analysts newly assigned to PA&E and the CAIG have performed cost and resource analyses using the cost analysis and systems analysis practices that have been adopted by PA&E and the CAIG. A focused and tailored training program is needed to introduce new analysts to the resource management and cost analysis practices of the Secretariat, in general, and PA&E and the CAIG staff, in particular.

Classification: Unclassified

Sponsor: OSD(PA&E)
The Pentagon, Rm. BE779
Washington, DC 20301
Mr. Russ Vogel, (703) 695-2612

Performer: IDA
Mr. Jim Wilson, (703) 845-2469

Resources: EY Dollars Staff-years
2002 \$100,000
2003 \$100,000

Schedule: Start End
Jun 2002 Sep 2003

Database: None

Publications: Classroom material/CDs

Keywords: Government, Estimating, Training, Study

PA&E-17

Title: Aircraft Cost Study-Indirect Labor and Material

Summary: Acquisition program tradeoff decisions will undoubtedly have a significant impact on the level of non-direct labor support requires for large defense programs. Given the growing importance of indirect costs, the CAIG needs to revisit how the DoD cost community estimates indirect costs to ensure that only accurate information enters the decision-making process. The study will consist of two parts: part 1 done by an FFRDC to address general issues regarding overhead, material and G&A costs and develop specific econometric models for forecasting these costs; and part 2 done by a contractor to gather cost data from in-house PA&E data sources and to develop an automated database of cost factors that will be used to estimate costs that do not involve direct labor.

Classification: Unclassified

Sponsor: OSD(PA&E)
The Pentagon, Rm. BE779
Washington, DC 20301
Dr Will Jarvis, (703) 695-7282

Performer: IDA, Unisys

Resources: *EY* *Dollars* *Staff-years*
2003 \$200,000

Schedule: *Start* *End*
Oct 2002 Sep 2003

Database: None

Publications: None

Keywords: Government, Estimating, Overhead/Indirect, Labor, Material, Study

PA&E-18

Title: Resource Analysis of DoD Central Training

Summary: This study aims to improve the Department's understanding of the complex relationship between Central Training, major characteristics of force structure and the department's investments in training and learning technologies. The project will develop a set of analytical tools using information from the FYDP, the annual Military Manpower Training Report and other data to forecast future Central Training resource requirements and workloads as a function of selected characteristics of force structure and training.

Classification: Unclassified

Sponsor: OSD(PA&E)
The Pentagon, Rm. BE798
Washington, DC 20301
Mr. Walt Cooper, (703) 697-4312

Performer: TBD

Resources: *EY* *Dollars* *Staff-years*
2003 \$200,000

Schedule: *Start* *End*
May20 03 Apr 2004

Database: None

Publications: None
Keywords: Government, Estimating, Training, Study

PA&E-19

Title: Plant Specific Overhead and Industrial Utilization Model

Summary: The intent of this study is to create specific models to assess the effects of acquisition reform, manufacturing location, new ways of doing business, subcontractor work content and off-loading manufacturing. The effort will update and expand the IDA Airlift Affordability Model to provide OSD with a comprehensive and coherent approach to assessing acquisition strategies in terms of scheduling production of systems produced at the same plant to meet defense requirements in an affordable manner.

Classification: Unclassified

Sponsor: OSD(PA&E)
The Pentagon, Rm. BE779
Washington, DC 20301
Mr. Gary Bliss, (703) 695-4348

Performer: IDA

Resources: EY Dollars Staff-years
2003 \$250,000

Schedule: Start End
Oct 2002 Sep 2003

Database: None

Publications: None

Keywords: Government, Estimating, Overhead/Indirect, Study

PA&E-20

Title: Aircraft Remanufacture, Upgrades, Modifications, SLEPs Database Development

Summary: In the last five years there have been more aircraft remanufacture, upgrades, modifications or service life extension programs than new aircraft starts. A recent macro-level study of remanufacture program costs concluded that cost growth in remanufacture programs is nearly as high as new start programs. Programs will be identified and a data collection effort will begin. Data collected will include pertinent technical, programmatic and cost information. Of important interest are classification categories of cost growth. The database will include raw and normalized data that will provide the basis for cost method development.

Classification: Unclassified

Sponsor: OSD(PA&E)
The Pentagon, Rm. BE779
Washington, DC 20301
Mr. Ed Kelly, (703) 697-6712

Performer: TBD

Resources: EY Dollars Staff-years
2003 \$250,000

Schedule: Start End
 Jun 2003 Apr 2004

Database: None

Publications: None

Keywords: Government, Estimating, Modification, Database, Study

PA&E-21

Title: Costing Research and Student Theses at AFIT and NPS

Summary: Graduate students at AFIT and NPS are required to prepare research theses for graduation. Students in the Operations Research, Operations Analysis, Financial Management, Cost Analysis, and Information Systems programs provide valuable analysis/research and gain direct experience when performing studies that are of interest to the CAIG. These study funds support graduate students and AFIT/NPS professional staff in satisfying prescribed study topics provided by the CAIG.

Classification: Unclassified

Sponsor: OSD(PA&E)
 The Pentagon, Rm. BE779
 Washington, DC 20301
 Mr. Russ Vogel, (703) 695-2612

Performer: AFIT & NPS

Resources: EY Dollars Staff-years
 2002 \$20,000
 2003 \$50,000

Schedule: Start End
 Oct 2001 Jan 2004

Database: None

Publications: Classroom material/CDs/Theses

Keywords: Government, Estimating, Training, Study

PA&E-22

Title: Initiation of Cost Estimating

Summary: Due to manpower reductions, conversion of military billets, and outsourcing, the Department has had a significant reduction in the number of cost analysts. This is occurring at a time when senior leadership is requiring decision-making analyses from the cost estimating community to support programs regardless of the event-- DAB, POM, Budget Submission, or basic cost analyses/estimating. Mr. Aldridge, USD/AT&L, supports an initiative to enhance the entire cost estimating community and establish a liaison with academia. Assistance w/ the establishment of an Institute and development of cooperative activities with several universities is required.

Classification: Unclassified

Sponsor: OSD(PA&E)
 The Pentagon, Rm. BE779
 Washington, DC 20301
 Mr. Russ Vogel, (703) 695-2612

<i>Performer:</i>	TBD		
<i>Resources:</i>	<u><i>FY</i></u>	<u><i>Dollars</i></u>	<u><i>Staff-years</i></u>
	2003	\$30,000	
<i>Schedule:</i>	<u><i>Start</i></u>	<u><i>End</i></u>	
	Jun 2003	Jan 2004	
<i>Database:</i>	None		
<i>Publications:</i>	None		
<i>Keywords:</i>	Government, Estimating, Training, Study		

Missile Defense Agency (MDA)

Name:	Missile Defense Agency MDA/PIE		
Address:	7100 Defense Pentagon, Washington, DC 20301-7100		
Director:	Jan Young, (703) 553-5699 E-mail: janice.young@mda.osd.mil		
Size:	Professional:	12	
	Support (w/Subs):	13	
	Consultants:	—	
	Subcontractors:	—	
Focus:	MDA Cost Policy, Cost Estimating, Cost Analysis, Cost Research/Methodology Improvement, POM and Budget Support		
Activity:	Number of projects in process:	10	
	Average duration of a project:	9 months	
	Average number of staff members assigned to a project:	1.5	
	Average number of staff-years expended per project:	1.4	
	Percentage of effort conducted by consultants:	0	
	Percentage of effort conducted by subcontractors:	100%	

MDA-1

Title:	MDA Cost Risk Methodology Update (Revision 5)		
Summary:	MDA will update the current MDA Cost Risk Methodology to keep it current. This effort incorporates new SAR and CCDR data, develops new cost growth equations, makes the risk model easier to use, and rewrites the User's Manual. MDA will provide the updated methodology to all MDA program elements for use as a cost risk methodology alternative.		
Classification:	Unclassified		
Sponsor:	MDA/PIE Jan Young (703) 553-5699		
Performer:	MCR Federal, Inc. Kyle Ratliff (703) 416-9500, Scott Vickers (703) 416-9500		
Resources:	<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
	2003	\$365,000	3.5
Schedule:	<u>Start</u>	<u>End</u>	
	TBD	Dec 2003	
Database:	<i>Description:</i>	SAR Database	
	<i>Automation:</i>	Microsoft Excel and Crystal Ball	
Publications:	MDA Cost Risk Methodology User's Handbook		
Keywords:	Government, Analysis, Estimating, Weapon Systems, Life Cycle, Risk/Uncertainty, Mathematical Modeling, Computer Model		

MDA-2

Title:	Missile Development Engineering Cost Estimating Relationship		
Summary:	MDA has a need for a cost estimating relationship that predicts missile Development Engineering costs. The model under development uses 100 th unit manufacturing cost, development time, new or modification program, range, and weight to predict development engineering costs.		
Classification:	Unclassified		
Sponsor:	MDA/PIE Jan Young (703) 553-5699		
Performer:	MCR Federal, Inc. Scott Vickers (703) 416-9500		
Resources:	<u>FY</u> 2003	<u>Dollars</u>	<u>Staff-years</u> .6 FTE
Schedule:	<u>Start</u> Jan 2002	<u>End</u> May 2003	
Database:	Database consists of historical CCDRs		
Publications:	Missile Defense Agency Technical Notice 03-01		
Keywords:	Government, Analysis, Estimating, Weapon Systems, Missile, SD&D		

MDA-3

Title:	Radar Cost Model		
Summary:	MDA/PIE currently uses the Radar Cost Model for supporting MDA business case analyses of radar alternatives. The model provides a robust capability to estimate missile defense radar costs early on, before the specifics of the radar design are known. The initial model consists of an Excel-based module driven by selected CERs and analogies to legacy MDA programs. The model accepts detailed design input, but can be run using only a few parameters that are typically known early in a program's concept development. Planned enhancements include improving the Operations and Support segment of the model and incorporating the MDA Cost Risk Methodology.		
Classification:	Unclassified		
Sponsor:	MDA/PIE Jan Young (703) 553-5699		
Performer:	MCR Federal, Inc. Kevin Cincotta, Scott Vickers (703) 416-9500		
Resources:	<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
	2002-03		3
Schedule:	<u>Start</u>	<u>End</u>	
	Nov 2001	Nov 2003	
Database:	<i>Description:</i>	Various references from the MDA Cost Research Library and CCDD data for MDA programs.	
	<i>Automation:</i>	Initially Microsoft Excel.	
Publications:	TBD		
Keywords:	Government, Analysis, Electronics, SD&D, Production, Operations and Support, Life Cycle, Mathematical Model, CER		

MDA-4

Title: MDA Cost Research Workshop

Summary: MDA conducts the 3rd annual Cost Research Workshop in November 2003. The purpose of the workshop is to provide a forum for the missile defense community to share results of missile defense related research projects, present new ideas, and to identify collective needs for future research. Invitations to the workshop are extended to government organizations, the academic community, and support contractors having an interest in missile defense cost analysis.

Classification: Unclassified

Sponsor: MDA/PIE
Jan Young (703) 553-6699

Performer:

Resources: FY Dollars Staff-years
2003

Schedule: Start End
Nov 2003 Nov 2003

Database: None

Publications: Research presentations will be available in Dec 03 on the MDA web site.

Keywords: Government, Survey, Review

MDA-5

Title: Estimating Costs of Interoperability as a Countermeasure Solution

Summary: Addresses two separate lines of inquiry- interoperability and ballistic missile countermeasures. Goal is to leverage recent advances in interoperability to preview similar advances in countermeasures. The approach will be to formulate the countermeasure arena so that interoperability techniques can be applied. The expected results include improved estimates of countermeasure effectiveness, ways to break out of the countermeasure-counter countermeasure spiral, cost estimates, and estimates of net effectiveness.

The study exploits the notion that interoperability concepts can solve "inadvertent countermeasures". Such methods as gridlock, sensor registration, precision cues, and composite tracking can resolve problems like clutter, debris, ID swaps, and closely-spaced objects. Possibly, other countermeasures may also be offset or mitigated by interoperability techniques.

This is an initial study to evaluate the concept. If proven useful to the estimating community, this project will likely be expanded in scope.

Classification: Unclassified

Sponsor: MDA/PIE
Jan Young (703) 553-5699

Performer: CSCI
Dr Conrad Strack (703) 866-4000

Resources: FY Dollars Staff-years
2003-04 .25 FTE

Schedule: Start End
May 2003 Apr 2004

Database: *Description:* Numerous MDA Technical and Cost Studies on TMD Interoperability
Automation: iThink, Excel

Publications: Technical Report
Keywords: Government, Analysis, Estimating, Missiles, Software

MDA-6

Title: Software Analysis of Platform Functionality

Summary: The purpose of this effort is to continue development of a basis of estimation for network-centric and interoperability costing. Work to date has produced several modest data sets strung together with an integrating logic. An important focus is to establish pattern and regularity among important relationships. These can include: (1) how interoperability functionality predictably drives software size; (2) how new software size predictably drives modification of weapon system legacy software; (3) how legacy software predictably drives integration effort. Desired results should permit greater refinement of cost estimates to specific interoperability functions (i.e., combat ID, track management, fire control, sensor registration etc.)

This is an initial study to evaluate the concept. If proven useful to the estimating community, this project will likely be expanded in scope.

Classification: Unclassified

Sponsor: MDA/PIE
Jan Young (703) 697-5699

Performer: CSCI
Dr Conrad Strack (703) 866-4000

Resources: FY Dollars Staff-years
2003-04 .25 FTE

Schedule: Start End
May 2003 Apr 2004

Database: Numerous MDA Technical and Cost Studies on TMD Interoperability

Publications: Technical Report TBD

Keywords: Government, Analysis, Estimating, Missiles, Software, Mathematical Modeling

MDA-7

Title: Single Integrated Air Picture (SIAP) System Engineer (SE) Interoperability Lessons Learned

Summary: Review and analysis of document files associated with the SIAP SE Task Force legacy to date. The SIAP SE TF in conjunction with the Services have been executing Link-16 related interoperability modifications to various air and missile defense weapon systems. This activity provides real world feedback on the cost, schedule and technical issues surrounding current interoperability work. This information may be of value in refining current theoretical models based on older program data and technical studies.

This is an initial study to evaluate the concept. If proven useful to the estimating community, this project will likely be expanded in scope.

Classification: Unclassified

Sponsor: MDA/PIE
Jan Young (703) 553-5699

Performer: CSCI
DR Conrad Strack (703) 866-4000,

Resources: FY Dollars Staff-years
2003-04 .25 FTE

Schedule: Start End
 May 2003 Apr 2004

Database: *Description:* Numerous MDA Technical and Cost Studies on TMD Interoperability
 Automation: iThink, Excel

Publications: Technical Report TBD

Keywords: Government, Analysis, Estimating, Missiles, Software

MDA-8

Title: Using U.S. Census Data to Estimate Cost, Cost Drivers and Realistic Cost Goals

Summary: This effort provides an overview of the U.S. Economic Census data and develops demonstration estimates to show the usefulness of census cost data. Activities include: 1) Review and report on current and recent census documents; 2) preparation of census-based cost driver model for a set of equipment showing how cost drivers run the model and how census data feed the cost drivers; 3) Creation of a pro forma census-based cost proposal for an MDA equipment showing weight-based unit cost driven by industry data for direct labor, fringe, OH, G&A and ODC materiel breakout; 4) Estimate reasonable and feasible cost improvement goals (i.e. private sector efficiency) .
 This is an initial study to evaluate the concept. If proven useful to the estimating community, this project will likely be expanded in scope.

Classification: Unclassified

Sponsor: MDA/PIE
 Jan Young (703) 553-5699

Performer: CSCI
 Dr Conrad Strack (703) 416-9500

Resources: FY Dollars Staff-years
 2003-04 .25

Schedule: Start End
 May 2003 Apr 2004

Database: *Description:* U.S. Economic Census, various MDA cost models
 Automation: Initially Microsoft Excel.

Publications: Technical Report TBD

Keywords: Government, Analysis, Mathematical Modeling, CER, Economic Analysis

MDA-9

Title: Schedule Analysis for MDA Programs

Summary: This research project examines new ways for MDA to assess the adequacy of planned schedules to complete development activities. The analysis includes a review of program milestones and the time required to progress between them at varying levels of effort. It will identify schedule drivers and use the drivers to develop equations that predict development time. The analysis will also develop a methodology for generating probability distributions for MDA schedules. MDA analysts will use the results of this analysis to determine a probability of overrun for MDA schedules. For 2003, we will address one of MDA's commodity areas. We plan to expand the analysis to include other commodities in future years.

Classification: Unclassified

Sponsor: MDA/PIE
 Jan Young (703) 553-5699

Performer: IDA
Dick Nelson (703) 845-2571

Resources: FY Dollars Staff-years
2003-04 \$200,000 1.0

Schedule: Start End
May 2003 Apr 2004

Database: Title: TBD
Description: TBD
Automation: TBD

Publications: Technical Report TBD

Keywords: Analysis, Missiles, Schedule, Method

MDA-10

Title: Develop Improved Methodologies for Estimating Costs of Space System Payloads

Summary: Methodologies available to estimate costs of developing and producing Space System Payloads rely on outdated data taken from systems that do not reflect today's technologies. This project will collect data on modern systems and develop improved cost estimating methodologies. Specific areas targeted for improvement include nonrecurring development, optical telescope, cryocooler, and focal plane array cost estimating methodologies. Proposed solutions include updated T1/NR element factors, parametric Cost Estimating Relationships, and analogies as appropriate. The results of this project will improve MDA's STSS cost estimate and have general applicability for the space community.

Classification: Unclassified

Sponsor: MDA/PIE
Jan Young (703) 553-5699

Performer: Tecolote Research
Mike Pfeifer (310) 536-0011

Resources: FY Dollars Staff-years
2003-04 TBD TBD

Schedule: Start End
May 2003 Apr 2004

Database: TBD

Publications: Technical Report TBD

Keywords: Government, Analysis, Mathematical Modeling, CER, Space Systems

Deputy Assistant Secretary of the Army for Cost & Economics (DASA(C&E))

Name:	Deputy Assistant Secretary of the Army for Cost & Economics (DASA(C&E))		
Address:	1421 Jefferson Davis Highway, Suite 9000, Arlington, VA 22201-3259		
Director:	Mr. Robert Young (703) 601-4200 DSN: 329-4200 FAX: (703) 601-4430		
Size:	Professional:	52	
	Support:	4	
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: - Database 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 Vehicle Systems - Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C⁴ISR) Systems - General Systems/Future Technology/Tools and Models Force - Unit Costing - Operating and Support Costing - Financial Management and Operations		
Activity:	Number of projects in process:	22	
	Average duration of a project:	12 months	
	Average number of staff members assigned to a project:	2	
	Average number of staff-years expended per project:	.1	
	Percentage of effort conducted in-house:	5%	
	Percentage of effort conducted by consultants/contractors:	95%	

DASA-CE-1

Title:	Operating and Support Management Information System (OSMIS) Database 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. Includes the development of the annual data collection process, collection of data from LIF, PMR, ULLS and other sources,

construction of the annual Materiel Systems Definition by system/Line Item Number, generation and validation of Weapon system to ammunition crosswalk tables, Unit tables and system asset tables, Cost Tables and OSMIS Cost Tables. This contract also develops O&S Cost Factors for the POM, BES and President's Budget, Aircraft reimbursement rates, Class II & 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). Other special studies include; Increase OSMIS database coverage for Contractor Logistics Support, Integrated Sustainment Maintenance, IMPAC purchases and warranty demands. 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 database.

Classification: Unclassified
Sponsor: DASA-CE
 Kathleen O'Brien, (703) 601-4155/DSN 329-4155
Performer: CALIBRE Systems, Inc.
Resources: FY Dollars
 2003 \$3,000,000
Schedule: Start End
 Ongoing
Database: OSMIS
Publications: U.S Army Operating and Support Management Information System (OSMIS) online interactive relational database
Keywords: Government, Estimating, Programming, Budgeting, Weapon Systems, Operations & Support, Training, Readiness, Reliability, Data Collection, Database, Computer Model

DASA-CE-2

Title: ACEIT Help-Desk/Training
Summary: This project funds the Army dial up support for technical assistance when required for Army Cost Analysts and Army support contractors. It includes the update of annual Inflation Indices, problem resolution, bug fixes and configuration control. This project also provides training for Army analysts.
Classification: Unclassified
Sponsor: DASA-CE
 David Henningsen, (703) 601-4163/DSN 329-4163
Performer: Tecolote Research, Inc.
Resources: FY Dollars
 2002 \$150,000
 2003 \$300,000
Schedule: Start End
 Ongoing
Database: IBM PC Compatible
Publications: ACE-IT Training Manuals
Keywords: Government, Estimating

DASA-CE-3

Title: ACEIT Enhancements

Summary: This project funds the enhancement and maintenance of the Automated Cost Estimating Integrated Tool (ACEIT) suite of tools. This effort funds a prioritized list of ACEIT enhancements requested Army cost analysts. In addition, this project funds the web enabling of the Automated Cost Database (ACDB).

Classification: Unclassified

Sponsor: DASA-CE
David Henningsen, (703) 601-4163/DSN 329-4163

Performer: Tecolote Research, Inc.

Resources: FY Dollars
2002 TBD

Schedule: Start End
May 2003 Sep 2004

Database: None

Publications: ACE-IT Version 6.0, ACEIT Version 7.0, Web Enabled ACDB Version 1.0

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

DASA-CE-4

Title: Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C⁴ISR) Systems

Summary: Continue to develop a comprehensive C⁴ISR Module for the Automated Cost Database (ACDB) by collecting additional cost, technical and program data, mapping it to the common WBS and entering it into the C/E database structure.

Classification: Unclassified

Sponsor: DASA-CE
Sher Dhaliwal, (703) 601-4179/DSN 329-4179

Performer: Technomics, Inc.

Resources: FY Dollars
2003 \$177,000 [shared with DASA-CE-5]

Schedule: Start End
Ongoing

Database: ACDB database

Publications: Updated database on CD

Keywords: Government, Estimating, Analysis, Electronics/Avionics, C&TD, SD&D, Production, Labor, Material, Overhead/Indirect, Engineering, Manufacturing, CPR/CCDR, WBS, Data Collection, Database

DASA-CE-5

Title: Sensor Cost Estimating Relationship (CER) Development

Summary: This project will continue the FY2002 effort to develop and update CER that estimate the prototype manufacturing and procurement manufacturing costs of sensors. The initial focus is on infrared (IR) sensors and will include missile, airborne, and ground systems sensors used for guidance, surveillance and targeting. The CER should include both

cooled and uncooled focal plane array technologies. Other sensor technologies of interest include millimeter wave (MMW), radio frequency (RF), and laser. The CER will allow the calculation of the cost of a full up sensor and not the costs involved in integrating the sensor into the missile, helicopter or ground system. In addition this effort will collect the sensor data required as inputs in commercial parametric estimating models.

Classification: Unclassified

Sponsor: DASA-CE
David Henningsen, (703) 601-4163/DSN 329-4163

Performer: Technomics, Inc.

Resources: FY Dollars
2003 \$177,000 [shared with DASA-CE-4]

Schedule: Start End
Ongoing

Database: None

Publications: CD containing CER results, raw data and parametric model input parameters

Keywords: Government, Estimating, Analysis, Electronics/Avionics, SD&D, Production, Manufacturing, Advanced Technology, Data Collection, Mathematical Modeling, Statistics/Regression

DASA-CE-6

Title: Tri-Service Missile and Smart Munitions Database

Summary: DASA-CE 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 that can be mapped and normalized to populate the Missile database. The database currently contains over 1,000 raw missile cost records. The database contains technical and programmatic data and can be used to develop learning curves and cost factors. In addition this effort will collect the sensor data required as inputs in commercial parametric estimating models.

Classification: Unclassified

Sponsor: DASA-CE
Tony Currie, (703) 601-4143/DSN 329-4143

Performer: MCR, Inc.

Resources: FY Dollars
2003 \$250,000

Schedule: Start End
Jan 2003 Dec 2003

Database: ACDB FoxPro database

Publications: Updated database on CD

Keywords: Government, Estimating, Analysis, Missiles, C&TD, SD&D, Production, Labor, Material, Overhead/Indirect, Engineering, Manufacturing, CPR/CCDR, WBS, Data Collection, Database

DASA-CE-7

Title: Wheel and Tracked Vehicle Database 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, database evaluation and management. In addition this effort will collect the sensor data required as inputs in commercial parametric estimating models.

Classification: Unclassified

Sponsor: DASA-CE
Tony Currie, (703) 601-4143/DSN 329-4143

Performer: Science Applications International Corporation (SAIC)

Resources: FY Dollars
2002 \$240,000

Schedule: Start End
Ongoing

Database: ACDB FoxPro database

Publications: Updated database on CD

Keywords: Government, Estimating, Analysis, Land Vehicles, C&TD, SD&D, Production, Labor, Material, Overhead/Indirect, Engineering, Manufacturing, CPR/CCDR, WBS, Data Collection, Database

DASA-CE-8

Title: Aircraft Module Database 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. 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, and the Improved Cargo Helicopter.

Classification: Unclassified

Sponsor: DASA-CE
Don Kehl, (703) 601-4140/DSN 329-4140

Performer: Ketron

Resources: FY Dollars
2003 \$105,000

Schedule: Start End
Ongoing

Database: ACDB FoxPro database

Publications: Updated database on CD

Keywords: Government, Estimating, Analysis, Helicopters, C&TD, SD&D, Production, Labor, Material, Overhead/Indirect, Engineering, Manufacturing, CPR/CCDR, WBS, Data Collection, Database

DASA-CE-9

Title: Standard Variable IDs for use in ACEIT

Summary: This project will determine standard variable IDs and ACE Exec codes for use in developing missile, vehicle, aircraft and communication systems cost estimates. This is a required first step in linking cost models to other cost, performance or engineering models. A standard ID is proposed down to level three of the work breakdown structure (WBS). The standard IDs will be incorporated into the Army WBS built into ACEIT by Tecolote.

Classification: Unclassified

Sponsor: DASA-CE
David Henningsen, (703) 601-4163/DSN 329-4163

Performer: DASA-CE/Tecolote Research, Inc.

Resources: FY Dollars
2003 TBD (Tecolote effort funded as part of DASA-CE-4)

Schedule: Start End
May 2002 Sep 2003

Database: None

Publications: Updated Army WBS incorporated into ACEIT

Keywords: Government, Estimating, Weapon Systems, Life Cycle, Survey, Computer Model

DASA-CE-10

Title: Tri-Service Missile and Smart Munitions Database Bluebook Update

Summary: This effort will update the 1993 Missile Bluebook based on the current missile ACDB. The Bluebook is a detailed reference guide that includes factors and learning curves for the missile systems included in the ACDB.

Classification: Unclassified

Sponsor: DASA-CE
David Henningsen, (703) 601-4163/DSN 329-4163

Performer: Tecolote Research, Inc.

Resources: FY Dollars
2002 \$75,000

Schedule: Start End
May 2002 Dec 2002

Database: None

Publications: 2002 Missile Bluebook (hardcopy and CD)

Keywords: Industry, Estimating, Missiles, C&TD, SD&D, Production, WBS, Mathematical Modeling, Statistics/Regression, Database

DASA-CE-11

Title: Standard Service Cost (SSC)

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.

Classification: Unclassified

Sponsor: DASA-CE
Steve Barth, (703) 601-4145/DSN 329-4145

Performer: Calibre Systems Inc.

Resources: FY Dollars
2003 TBD

Schedule: Start End
Ongoing

Database: IBM PC Compatible

Publications: None

Keywords: Government, Programming, Budgeting, Facilities, Infrastructure, Operations & Support, Labor, Overhead/Indirect, Data Collection, Mathematical Modeling, CER

DASA-CE-12

Title: Personnel Costing System

Summary: The Personnel Costing System consists of two modules, (1) the Civilian Costing System (CCS) and (2) 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: DASA-CE
Steve Barth, (703) 601-4145/DSN 329-4145

Performer: Calibre Systems Inc.

Resources: FY Dollars
2003 TBD

Schedule: Start End
Ongoing

Database: IBM PC Compatible

Publications: None

Keywords: Government, Estimating, Manpower/Personnel, Life Cycle, Labor, Data Collection, Mathematical Modeling, Computer Model

DASA-CE-13

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: DASA-CE
Joe Gordon, (703) 601-4147/DSN 329-4147

Performer: Management Analysis Inc.

Resources: FY Dollars

	2003	TBD
Schedule:	<u>Start</u>	<u>End</u>
	Ongoing	
Database:	IBM PC Compatible	
Publications:	None	
Keywords:	Government, Estimating, Forces, Operations & Support, Data Collection, Mathematical Modeling, Computer Model	

DASA-CE-14

Title:	Unmanned Aerial Vehicle Data Collection and CER	
Summary:	This project will develop CER that calculate the procurement cost for unmanned aerial vehicles and their payloads. The CER will incorporate both physical and performance characteristics. In addition this effort will collect the data required as input in commercial parametric estimating models.	
Classification:	Unclassified	
Sponsor:	DASA-CE David Henningsen, (703) 601-4163/DSN 329-4163	
Performer:	TBD	
Resources:	<u>FY</u>	<u>Dollars</u>
	2002	\$225,000
Schedule:	<u>Start</u>	<u>End</u>
	May 2002	Sep 2003
Database:	None	
Publications:	CER and report on CD	
Keywords:	Government, Estimating, Aircraft, Production, Manufacturing, Data Collection, Mathematical Modeling, Cost/Production Function, CER	

DASA-CE-15

Title:	COTS Electronics Database/Modeling	
Summary:	In FY2002 emphasis is being placed on collecting new types of electronic components and is analyzing and validating and/or expanding the statistical estimating relationships and risk parameters in the model. In FY2003 emphasis will be placed on collecting new potential technologies on commercial electronics, creating statistical relationships, and on using technical performance specifications or parameters to estimate commercially available equipment pricing. This effort will be added to the Air Force Cost Analysis Agency (AFCAA) contract.	
Classification:	Unclassified	
Sponsor:	DASA-CE David Henningsen, (703) 601-4163/DSN 329-4163	
Performer:	Mission Research Corp. (MRC)	
Resources:	<u>FY</u>	<u>Dollars</u>
	2002	\$125,000
	2003	TBD

Schedule: Start End
 Sep 2002 TBD

Database: Excel

Publications: Final Report and Excel based models

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

DASA-CE-16

Title: Unmanned Ground Vehicles/Robotics Data Collection and CER

Summary: This project will develop CER that calculate the development, prototype manufacturing and manufacturing costs for unmanned ground vehicles (UGV) and robotic systems. The CER will calculate top level costs as well as costs of payloads. The CER will incorporate both physical and performance characteristics. Ideally, inputs will consist of performance characteristics. In addition this effort will collect the data required as input in commercial parametric estimating models.

Classification: Unclassified

Sponsor: DASA-CE
 David Henningsen, (703) 601-4163/DSN 329-4163

Performer: TBD

Resources: FY Dollars
 2002 TBD

Schedule: Start End
 May 2002 Jun 2003

Database: None

Publications: Database and CER on CD

Keywords: Government, Estimating, Land Vehicles, Production, Manufacturing, Data Collection, Mathematical Modeling, Cost/Production Function, CER

DASA-CE-17

Title: C⁴ISR Cost-Performance Estimating Relationships

Summary: The objective of this project is to collect data and develop cost-performance estimating relationships (CPER) for C⁴ISR hardware and software systems. A key area of interest is software required for the integration of various C⁴ISR systems. The hardware portion of this effort will concentrate on unattended ground sensors. The goal is to develop a cost estimating capability that relates incremental performance improvements with incremental increases in cost. In addition to the data collected to support CER development, sufficient data will be collected to allow the use of commercial hardware and software parametric cost estimating models. This effort is performed under a NAVAIR contract.

Classification: Unclassified

Sponsor: DASA-CE
 David Henningsen, (703) 601-4163/DSN 329-4163

Performer: Technomics, Inc.

Resources: FY Dollars
 2002 \$317,000

Schedule: Start End
 Sep 2002 Sep 2003

Database: None

Publications: Database and CER on CD

Keywords: Government, Estimating, Analysis, Electronics/Avionics, Advanced Technology, C&TD, SD&D, Production, Manufacturing, Data Collection, Database

DASA-CE-18

Title: Missile Propulsion Cost Performance Estimating Relationships

Summary: The objective of this project was to collect data and develop cost-performance estimating relationships (CPER) for loitering missile propulsion units. In addition to the data collected to support CPER development, sufficient data was collected to allow the use of commercial parametric cost estimating models. Complexity factors were developed that could be used in the PRICE-H model. The effort developed CPER that will estimate prototype manufacturing and manufacturing costs for current and future missile systems.

Classification: Unclassified

Sponsor: DASA-CE
 David Henningsen, (703) 601-4163/DSN 329-4163

Performer: Tecolote Research, Inc.

Resources: FY Dollars
 2002 \$75,000

Schedule: Start End
 Jun 2002 Mar 2003

Database: None

Publications: Report, Data, and CPER on CD

Keywords: Industry, Estimating, Missiles, C&TD, SD&D, Production, WBS, Mathematical Modeling, Database

DASA-CE-19

Title: Turbo-jet and Turbo-fan Propulsion Unit Cost Performance Estimating Relationships

Summary: The objective of this project is to expand on the Loitering Missile Propulsion Unit effort completed in March 2003 by collecting additional data on turbo-jet propulsion units, updating the CPER and developing CPER for turbofan propulsion units. In addition to the data collected to support CPER development, sufficient data will be collected to allow the use of commercial parametric cost estimating models. The effort will develop CPER that will estimate prototype manufacturing and manufacturing costs for current and future missile systems and unmanned aerial vehicles.

Classification: Unclassified

Sponsor: DASA-CE
 David Henningsen, (703) 601-4163/DSN 329-4163

Performer: Tecolote Research, Inc.

Resources: FY Dollars
 2003 \$90,000

Schedule: Start End
 May 2003 Feb 2004

Database: None

Publications: Report, Data and CPER on CD

Keywords: Industry, Estimating, C&TD, SD&D, Production, WBS, Mathematical Modeling, Database

DASA-CE-20

Title: Hybrid Electric Vehicle Cost Performance Estimating Relationships

Summary: The objective of this project is to collect data and develop cost- performance estimating relationships (CPER) for Hybrid Electric Vehicle (HEV) component. In addition to the data collected to support CPER development, sufficient data will be collected to allow the use of commercial parametric cost estimating models.

Classification: Unclassified

Sponsor: DASA-CE)
 David Henningsen, (703) 601-4163/DSN 329-4163

Performer: TBD

Resources: FY Dollars
 2002 \$200,000

Schedule: Start End
 June 2002 Jul 2003

Database: None

Publications: Database and CPER on CD

Keywords: Government, Estimating, Analysis, Land Vehicles, C&TD, SD&D, Production, Manufacturing, Data Collection, Database

DASA-CE-21

Title: Integrated Performance Cost Model (IPCM)

Summary: This is first phase of a project to develop and integrate a cost model with engineering and requirements tools. This phase develops the overall architecture and a roadmap for the multiyear project. The model is expected to be scalable and estimate both system level costs as well as component level costs. The strategy proposes to select two contractors to develop the architecture document and an evaluation will be held to down select to one contractor to develop a prototype model and/or demonstrate proof of concept. In the second half of FY2004 we propose to issue a contract to begin work on the final model.

Classification: Unclassified

Sponsor: DASA-CE
 Ruth Johnson, (703) 601-4183/DSN 329-4183

Performer: TBD

Resources: FY Dollars
 2003 TBD

Schedule: Start End
 May 2003 May 2004

Database: None

Publications: Architecture document
Keywords: Analysis, Computer Model

Army Materiel Command (AMCRM)

No input submitted.

Tank-automotive and Armaments Command (TACOM)

Name:	U.S. Army Tank-automotive and Armaments Command, Cost & Systems Analysis		
Address:	6501 E. 11 Mile Road, Warren, MI 49397-5000		
Director:	Richard S. Bazzzy		
Size:	Professional:	48	
	Support:	3	
	Consultants:	0	
	Subcontractors:	0	
Focus:	Responsible for preparation of program office estimates, life cycle cost estimates, economic analyses, and combat effectiveness modeling. Supports the development of combat and tactical vehicles.		
Activity:	Number of projects in process:	30	
	Average duration of a project:	3–20 weeks	
	Average number of staff members assigned to a project:	1–3	
	Average number of staff-years expended per project:	.5	
	Percentage of effort conducted by consultants:	0%	
	Percentage of effort conducted by subcontractors:	0%	

TACOM-1

Title:	Price Model Calibration—Combat Vehicles		
Summary:	The objective of this project is to calibrate the PRICE model to allow for Combat Vehicle Estimates to be developed using the PRICE model.		
Classification:	Unclassified		
Sponsor:	TACOM Cost & Systems Analysis		
Performer:	TACOM Cost & Systems Analysis Ron DiCesare, Christopher Cristante		
Resources:	<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
	2003	\$25,000	.25
Schedule:	<u>Start</u>	<u>End</u>	
	FY03	FY04	
Database:	None		
Publications:	None		
Keywords:	Estimating, Life Cycle, Land Vehicles		

Army Aviation and Missile Command (AMCOM)

Name:	Cost Analysis Division, Command Analysis Directorate U.S. Army Aviation & 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 Claudia L. Rhen, Chief, Cost Analysis Division (256) 842-7843, Fax (256) 842-9333 Claudia.Rhen@redstone.army.mil		
Size:	Professional:	32	
	Support:	1	
	Consultants:	N/A	
	Subcontractors:	N/A	
Focus:	Provide cost estimation and analysis support to Aviation, Tactical Missiles, and Air 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:	48	
	Average duration of a project:	3–26 weeks	
	Average number of staff members assigned to 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%	

No ongoing projects at this time.

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:	Kay R. Ward, Director, Research, Development and Acquisition Jackson G. Calvert, Chief, Cost Analysis Division, (205) 955-3612		
Size:	Professional:	10	
	Support:	0	
	Consultants:	N/A	
	Subcontractors:	N/A	
Focus:	Systems Costs, Component Cost Analyses, Economic Analyses		
Activity:	Number of projects in process:	1	
	Average duration of a project:	1 year	
	Average number of staff members assigned to a project:	3	
	Average number of staff-years expended per project:	0.5	
	Percentage of effort conducted by consultants:	0%	
	Percentage of effort conducted by subcontractors:	0%	

SMDC–1

Title:	Base Operations Cost Estimating Relationship Development		
Summary:	There has been little research and development of equations in the past that focus on installation base operations costs. Since SMDC is involved in the development of an installation at Ft. Greely, Alaska, this research was performed to assist in estimating costs associated with the operation of an Army facility. The cost estimating methods developed through this research utilize the majority of the data available for Army installations, and thus are relevant for estimating costs for most installations. The effort includes the development of twenty-seven (27) cost estimating relationships (CERs). The database utilized for each CER is provided, along with documentation for each CER developed, to include relevant fit-statistics, plots, and graphs.		
Classification:	Unclassified		
Sponsor:	Jack Calvert, (205) 955-3612, jack.calvert@smdc.army.mil		
Performer:	SMDC Command Analysis Division		
Resources:	<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
	2002	\$0	0.5
Schedule:	<u>Start</u>	<u>End</u>	
	Jan 2002	Nov 2002	
Database:	<i>Title:</i>	None	
	<i>Description:</i>	DoD systems	
	<i>Automation:</i>	Available electronically (in MS Word); soon in PDF format	
Publications:	<i>Base Operations Cost Estimating Relationship Development</i> , Bill Hughes, Warren Fitzgerald, and Roger Yocom, Unclassified, November 2002.		
Keywords:	Estimating, Budgeting, Infrastructure, Operations and Support, Data Collection, Statistics/Regression, Database, CER		

SMDC-2

Title: Missile Defense Propulsion Cost Research

Summary: There are no existing cost estimating relationships that focus on the lighter, faster propulsion systems required for missile defense. This research includes adding a small number of additional missile programs to the existing database, adding several explanatory performance variables, and developing a cost estimating relationship for these fast propulsion systems.

Classification: Unclassified

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

Performer: SMDC Command Analysis Division

Resources:

<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
2002		0.2
2003		0.5

Schedule:

<u>Start</u>	<u>End</u>
Jul 2002	Jun 2003

Database:

Title: Missile Propulsion

Description: DoD systems

Automation: To be available in MS Word and PDF formats

Publications: TBD

Keywords: Government, Industry, Estimating, Missiles, SD&D, Advanced Technology, Data Collection, Statistics/Regression, Data Base, CER

SMDC-3

Title: THAAD Radar Environmental Quality Life Cycle Cost Estimate (EQLCCE)

Summary: This estimate conformed to the guidelines set forth in the Environmental Quality Life Cycle Cost Estimating Handbook for Material Acquisition, draft dated June 2001. This is the first EQLCCE done for the THAAD system. Activities included collection of data and constructing an ACEIT model. Elements of cost addressed are Overhead, Tradeoff Analysis, NEPA, Pollution Prevention, Conservation, Remediation and Restoration, and Demilitarization and Disposal.

Classification: Unclassified

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

Performer: SMDC Command Analysis Division/Army Environmental Center

Resources:

<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
2001	\$30,700	0.05

Schedule:

<u>Start</u>	<u>End</u>
Jul 2001	May 2003

Database:

Title: None

Description: DoD systems

Automation: MS Word and PDF format

Publications: THAAD Radar Environmental Quality Life Cycle Cost Estimate (EQLCCE), CR-1121, November 2001

Keywords: Government, Industry, Estimating, Missiles, Life Cycle, Environment, Data Collection, Study

SMDC-4

Title: PAC-3 Environmental Quality Life Cycle Cost Estimate (EQLCCE)

Summary: This estimate conformed to the guidelines set forth in the Environmental Quality Life Cycle Cost Estimating Handbook for Material Acquisition, draft dated June 2001. Elements of cost addressed are Overhead, Tradeoff Analysis, NEPA, Pollution Prevention, Conservation, Remediation and Restoration, and Demilitarization and Disposal.

Classification: Unclassified

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

Performer: SMDC Command Analysis Division/Army Environmental Center

Resources:

<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
2002	\$47,829	0.05

Schedule:

<u>Start</u>	<u>End</u>
Jan 2002	Jun 2003

Database:

<i>Title:</i>	None
<i>Description:</i>	DoD systems
<i>Automation:</i>	MS Word and PDF format

Publications: TBD

Keywords: Government, Industry, Estimating, Missiles, Life Cycle, Environment, Data Collection, Study

Naval Cost Analysis Division (NCAD)

Name:	Naval Cost Analysis Division (NCAD)		
Address:	Nebraska Avenue Complex, 4290 Mount Vernon Drive, NW, Suite 18200, Washington, DC 20393-5444		
Director:	Captain David Ziemba, USN, (202) 764-2430		
Size:	Professional:	8 civilian; 1 military	
	Support:		
	Consultants:		
	Subcontractors:		
Focus:	The Naval Cost Analysis Division (NCAD) prepares independent cost estimates for DON ACAT 1C programs and for major automated information systems. NCAD also manages the DON VAMOSC Program and coordinates DON cost research. The focus of the NCAD cost research program is as follows: 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 SDD/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:	10	
	Average duration of a project:	1–2 yrs	
	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	

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

Ms. Wendy Kunc, (202) 764-2773,
Specialist Procurement Services/Cost Forecasting (SPS/CF)
MoD Abbey Wood
P.O. Box 702
Bristol BS12 7DU
UK

Mr. Paul Wood, UK, 011 44 117 91 32686

Performer: NCCA in-house, UK MoD in-house, and HVR Consulting Services, Ltd.
Ms. Wendy Kunc, NCCA, (202) 764-2773
Mr. Paul Wood, UK MoD, 011 44 117 91 32686
Mr. Jonathan Coyle, UK, HVR Consulting Services Ltd., 011 44 1420 87977

Resources:	<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
	1996	UK\$ only	1.0
	1997	UK\$ only	1.5
	1998	\$123,000 + UK\$	0.75
	1999	\$125,000 + UK\$	0.5
	2000	\$96,203 + UK\$	0.5
	2001	\$100,000 + UK\$	0.5
	2002	\$125,000 + UK\$	0.5
	2003	\$100,000	0.1

Schedule:	<u>Start</u>	<u>End</u>
	Jan 1997	Nov 1997—Version 1 development
	Dec 1997	Feb 1998—Version 2 development
	Aug 1998	Apr 1999—Version 3 development
	May 1999	Apr 2000—Version 4 development
	Jun 2000	Sep 2001—Version 5 development
	Dec 2001	July 2002—Version 6 development

Database: VAMOSC/other cost data and technical data

Publications: Training information, model software, and supporting documentation available on Web site, www.oscamtools.com

Keywords: Government, Estimating, Analysis, Operations and Support, Sustainability, Ships, Mathematical Modeling, Statistics/Regression, Database, Method, CER, Study

NCAD-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: NCCA
Nebraska Avenue Complex

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

Ms. Wendy Kunc, (202) 764-2773

Performer: NCCA in-house, UK MoD in-house, and HVR Consulting Services, Ltd.
Ms. Wendy Kunc, NCCA, (202) 764-2773
Mr. Jonathan Coyle, UK MoD, HVR Consulting Services, Ltd., 011 44 1420 87977

Resources:	<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
	1999	\$100,000 + UK\$	0.75
	1900	\$105,000	0.75
	2001	\$106,000	0.5
	2002	\$227,000	0.1

Schedule:	<u>Start</u>	<u>End</u>
	Apr 1999	Sep 1999—Prototype development
	Oct 1999	Apr 2000—Version 1 development
	Jun 2000	Sep 2001—Continuing development
	Dec 2001	Nov 2002—Version 2 development
	Mar 2003	Mar 2003—Verification and Validation

Database: VAMOSC/other cost data and technical data

Publications: Training information and supporting documentation available on Web site,
www.oscamtools.com

Keywords: Government, Estimating, Analysis, Operations and Support, Sustainability, Aircraft,
Mathematical Modeling, Statistics/Regression, Database, Method, CER, Study

NCAD-3

Title: Naval VAMOSC Management Information System

Summary: The Visibility and Management of Operating and Support Costs (VAMOSC) management information system displays Naval operating and support (O&S) costs and related information (e.g., operating hours or manning levels) for ships, shipboard systems, aircraft, weapons, and USMC ground systems. Depending on the specific commodity type and system, the VAMOSC Oracle relational databases contain up to 18 years of data presented by fiscal year by alternative hierarchical cost element structures. Depending on the cost element, data for a particular commodity are available not only at the system level, but also at the subsystem and component levels. Detailed ship and aviation maintenance data provide additional insight into Organizational, Intermediate, and Depot level maintenance man-hours and parts costs. Ship O&I level maintenance data are reported by ship and Equipment Identification Code, and ship public depot maintenance data are reported by ship and Expanded Ship Work Breakdown Structure. Aviation O&I maintenance data are reported by Type/Model/Series and Work Unit Code. 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. A detailed manpower database will be available during FY03.

Classification: Unclassified

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

Ms. Wendy Kunc, (202) 764-2773

Performer: IBM Business Consulting

Ms. Wendy Kunc, NCCA Program Manager, (202) 764-2773
 Mr. Don Clarke, IT Lead, (202) 764-2883
 Mr. Al Leung, IBM Business Consulting, (703) 633-4305

Resources: FY Dollars Staff-years
 2000 \$2,800,000 5.0
 2001 \$2,035,000 5.0
 2002 \$2,615,000 5.0
 2003 \$2,700,000 2.5

Schedule: Start End
 FY99 continuing

Databases: VAMOSC Ships, Shipboard Systems, Aviation, Weapons, USMC Ground Systems, Personnel

Publications: Data and supporting documentation accessible via www.navyvamosc.com and www.usmcvamosc.com

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

NCAD-4

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. Effort completed in FY-02.

Classification: Unclassified

Sponsor: NCCA
 Nebraska Avenue Complex
 4290 Mount Vernon Drive, N.W., Suite 18200
 Washington, DC 20393-5444
 Mr. Tom Burton, (202) 764-2612

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

Resources: FY Dollars Staff-years
 2000 \$165,000

Schedule: Start End
 Sep 2000 Sep 2002

Database: Raw and normalized COTS and MILSPEC data

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

Keywords: Government, Estimating, Electronics/Avionics, Ships, Production, Modification, Case study, Database

NCAD-5

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. Phase I concentrated on developing an integration work breakdown structure, identifying integration cost drivers, collecting contractor data, and developing top-level contractor integration cost estimating relationships. Phase I is

complete. Phase II follow-on focuses on continuing cost collection and developing cost estimating relationships.

Classification: Cost Data: Business Sensitive
Technical Characteristics: Business Sensitive

Sponsor: NCCA
Nebraska Avenue Complex
4290 Mount Vernon Drive, N.W., Suite 18200
Washington, DC 20393-5444
Mr. Tom Burton, (202) 764-2612

Performer: Phase I—Gibbs & Cox, Inc., Lockheed Martin Corporation, and Technomics, Inc.
Phase II—Technomics, Inc.

Resources:

<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
2000	\$325,000—Phase I	
2001	\$75,000—Phase I	
2002	\$147,000—Phase II	

Schedule:

<u>Start</u>	<u>End</u>
Sep 2000	Dec 2002—Phase I
Jan 2003	Dec 2003—Phase II
TBD	TBD—Phase III

Database: 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, Electronics/Avionics, Production, Operations and Support, Integration, Modification, WBS, Data Collection, Database

NCAD-6

Title: Ship Construction Cost Database (SCCD)

Summary: Develop a normalized database of historical ship construction costs and technical characteristics for inclusion in the Automated Cost Data Base (ACDB). There are two phases to this program. Phase I is complete. Phase I included the development of the database. Phase II provides an update to the database and includes enhancing the database with additional technical characteristics to support CER development.

Classification: Cost Data: Business Sensitive
Technical Characteristics: Unclassified

Sponsor: NCCA
Nebraska Avenue Complex
4290 Mount Vernon Drive, N.W., Suite 18200
Washington, DC 20393-5444
Mr. Tom Burton, (202) 764-2612

Performer: Tecolote Research, Inc.

Resources:

<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
2001	\$300,000—Phase I	
02	\$50,000—Phase II	

Schedule:

<u>Start</u>	<u>End</u>
Sep 2000	Completed—Phase I
Dec 2002	Oct 2003—Phase II

Database: Ship construction costs and technical characteristics
Publications: Automated data base plus report detailing methodology and user's manual
Keywords: Government, Estimating, Ships, Production, Manufacturing, Data Collection, Database

NCAD-7

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 was 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: NCCA
 Nebraska Avenue Complex
 4290 Mount Vernon Drive NW, Suite 18200
 Washington, DC 20393-5444
 Mrs. Cheri E. Cummings, (202) 764-2662; Robert Hiram (202) 764-2615
Performer: NCCA in-house and Upper Mohawk, Inc.
 Ms. Pamela L. Johnson, Upper Mohawk
 Mr. Mike Tran, NSWCD, (301) 227-5028
 Mr. William Brundick, (717) 993-3501
Resources:

<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
2000	\$274,226	

Schedule:

<u>Start</u>	<u>End</u>
Oct 2000	Apr 2003

Database: Separate NCCA software databases covering effort, schedule, labor rate and SLOC growth
Publications: TBD
Keywords: Government, Analysis, Electronics/Avionics, Life Cycle, Software, Data Collection, Database, Schedule, Risk/Uncertainty

NCAD-8

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 NSWCD project entitled, "Software Maintenance Cost Process Model."
Classification: Unclassified
Sponsor: NCCA
 Nebraska Avenue Complex
 4290 Mount Vernon Drive NW, Suite 18200
 Washington, DC 20393-5444
 Ms. Cheri Cummings, (202) 764-2662; Robert Hiram (202) 764-2615

Performer: NCCA in-house and Technomics, Inc.
 Ms. Pamela L. Johnson, NCCA
 Ms. Jennifer Echard, NCCA
 Mr. Brian Ochteau, Technomics, (703) 415- 7505
 Mr. Jason Lee, Technomics, (703) 415-1007

Resources:

<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
1996	\$74,000	0.1
1997	\$50,000	0.1
1998	\$100,000	0.1
1999	\$0	0.15
2000	\$182,400	1.2

Schedule:

<u>Start</u>	<u>End</u>
Feb 1996	Feb 2003

Database: TBD

Publications: TBD

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

NCAD-9

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: NCCA
 Nebraska Avenue Complex
 4290 Mount Vernon Drive NW, Suite 18200
 Washington, DC 20393-5444
 Ms. Cheri Cummings, (202) 764-2662; Robert Hiram (202) 764-2615

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

Resources:

<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
2000	\$98,900	1.0

Schedule:

<u>Start</u>	<u>End</u>
Oct 2000	Apr 2002

Database: TBD

Publications: TBD

Keywords: Government, Estimating, Data Collection, Statistics/Regression, Database, CER, Life Cycle

NCAD-10

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: NCCA
Nebraska Avenue Complex
4290 Mount Vernon Drive NW, Suite 18200
Washington, DC 20393-5444
Ms. Cheri Cummings, (202) 764-2662; Robert Hiram (202) 764-2615

Performer: NCCA in-house and Technomics, Inc.
Ms. Pamela L. Johnson, NCCA
Ms. Jennifer Echard, NCCA
Mr. Jeff Cherwonik, Technomics, (703) 415-1006
Mr. Jason Lee, Technomics, (703) 415-1007

Resources:	<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
	2000	\$63,668	0.4

Schedule:	<u>Start</u>	<u>End</u>
	Oct 2000	Feb 2003

Database: TBD

Publications: TBD

Keywords: Government, Estimating, Weapon Systems, Data Collection, Database

Office of Naval Research (ONR)

Name:	Office of Naval Research (ONR)		
Address:	800 N. Quincy Street, Arlington, VA 22217-5600		
Director:	Dr. Jane Alexander		
Size:	Professional:		
	Support:		
	Consultants:		
	Subcontractors:		
Focus:	Research in Cost Analysis Methods		
Activity:	Number of projects in process:	5	
	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 effort includes development of a Maintenance Cost model, development of minimum cost Preventive Maintenance policies, development of methods to determine reliability of components with very small sample testing, 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/or fuzzy logic and model validation/verification. This provides results immediately available to Navy program managers in the DD-X, NSSL, 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		
Performers:	Louisiana Tech University PO Box 10348 Ruston, LA 71272-0046 Dr. Dileep R. Sule (318) 257-3394	University of New Orleans Gulf Coast Region Maritime Tech Ctr. UNO, Sta. 122, 5100 River Rd. Avondale, LA 70094 Dr. Alley C. Butler, PE (504) 437-2594	

Resources:	<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
	1999	\$246,000*	
	2000	\$34,000*	
	2002	\$68,000	
	*matching funds and in-kind contribution from State of Louisiana and Louisiana Tech University total \$362,000		
Schedule:	<u>Start</u>	<u>End</u>	
	15 May 1999	30 Sep 2003	
Database:	None		
Publications:	Public Domain as appropriate		
Keywords:	Government, Ships, C&TD, Mathematical Modeling, Risk/Uncertainty		

ONR-2

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

Summary: *Phase I:*

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, VAMOSE, and other models. This project develops a flexible and extendable tool providing automation and decision support for Navy S&T managers.

Phase II:

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 positivistic 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

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
PO Box 10348
Ruston, LA 71272-0046
Dr. Dileep R. Sule
(318) 257-3394

University of New Orleans
Gulf Coast Region Maritime Tech Ctr.
UNO, Sta. 122, 5100 River Rd.
Avondale, LA 70094
Dr. Alley C. Butler
(504) 437-2594

Newport News Shipbuilding
4101 Washington Avenue
Newport News, VA 23607
Mr. Robert Schatzel
(757) 688-2124

Naval Sea Systems Command (SEA 0176)
1333 Isaac Hull Avenue SE
Washington Navy Yard, DC 20376-5060
Mr. Irvin Chewning
(202) 781-2697

Resources: FY Dollars Staff-years

2000	\$156,000**
2001	\$194,000**
2002	\$48,000

*in-kind contribution from Louisiana Tech University total \$8,000

**assigned \$88,000 for NAVSEA 017

Schedule: Start End
Feb. 17, 2000 April 30, 2003

Database: None

Publications: Public Domain as appropriate

Keywords: Industry, Government, Estimating, Ships, C&TD, Operations and Support, Risk/Uncertainty, Data Collection, Expert System

ONR-4

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, Northrup Grumman Ship Systems Avondale Operations, the University of New Orleans, NSWC Carderock, and Louisiana State University.

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 State University	NSWC Carderock
CEBA 2508	9500 MacArthur Blvd.
Baton Rouge, LA 70803	West Bethesda, MD 20817
Dr. H. Dwayne Jerro	Dr. Milton Critchfield
(225) 578-5808	(301) 227-1769
Northrop Gruman Corporation	University of New Orleans
Ship Systems Avondale	913 Engineering Building
Operations	New Orleans, LA 70148
PO Box 50280	Dr. Alley C. Butler, PE
New Orleans, LA 70150	(504) 468-6339
Mr. John White	
(504) 437-3328	
Louisiana Tech University	
PO Box 10348	
Ruston, LA 71272-0046	
Dr. Dileep Sule	
(318) 257-3394	

Resources:	<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
	2000	\$130,000*	
	2001	\$84,000*	
	2002	\$184,000*	
	2003	\$68,000	
	2004	\$84,000	

* in-kind contributions: Louisiana Tech University, \$15,000; Avondale Industries, \$56,000; and Carderock, \$147,500. Assigned \$95,000 for Carderock.

Schedule:

<u>Start</u>	<u>End</u>
Aug 17, 2000	September 30, 2003

Database: None

Publications: Public Domain as appropriate

Keywords: Industry, Government, Estimating, Ships, C&TD, Production, Life Cycle, Operations and Support, Risk/Uncertainty, Reliability, Data Collection, Expert System, Material

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 (DEA).

Sponsor: Office of Naval Research
800 North Quincy Street
Arlington, VA 22217
Ms. Katherine Drew, (703) 696-5992 Voice, (703) 696-4884 Fax

Performer: Virginia Tech
Grado Department of Industrial and Systems Engineering
System Performance Laboratory
Dr. Kostas Triantis, Principal Investigator, (703) 538-8446
Newport News Shipbuilding
4101 Washington Avenue
Newport News, VA 23607
Mr. Robert Schatzel, (757) 688-2124
Naval Sea Systems Command (SEA 0176)
1333 Isaac Hull Avenue SE
Washington Navy Yard, DC 20376-5060
Mr. Irwin Chewning, (202) 781-2697

Resources:

<u>Year</u>	<u>Dollars</u>
2000	\$103,000*
2001	\$250,000*
2002	\$146,000
2003	\$30,000*

*assigned \$88,000 for NAVSEA 017.

Schedule:

<u>Start</u>	<u>End</u>
May 2000	Dec 22, 2003

Database: VAMOSOC and other cost and technical data.

Publications: Technical reports, scholarly refereed publications, and model documentation:
Vaneman, W., and K. Triantis, "The Dynamic Production Axioms and System Dynamics Behaviors: The Foundation for Future Integration," *Journal of Productivity Analysis*, 19 (1), 93-113, 2003.
Monga, P. "A System Dynamics Model of the Development of New Technologies for Ship Systems Pavinder Monga, MS Thesis, Virginia Tech, 2001.

Vaneman, W., "Evaluating Performance in a Complex and Dynamic Environment" Ph.D. Dissertation, Virginia Tech, December 2002

Scott, J., "A System Dynamics Model of the Operations, Maintenance and Disposal Costs of New Technologies for Ship Systems," M.S. thesis, Virginia Tech, October 2002.

Damle, P., "System Dynamics Modeling Approach for the Technology Integration of New Technologies in Ship Systems," M.S. Thesis, Virginia Tech, May 2003.

Monga, P., and Triantis, K., "The Behavior of New Technology Development: A System Dynamics Approach," *Twentieth International Conference of System Dynamics Society*, Palermo, Italy, August 2002.

Vaneman, W. K., and Triantis, K., "Planning for Technology Implementation: An SD(DEA) Approach," *Technology Management in the Knowledge Era*, D.F. Kocaoglu, et al., eds., PICMET: Portland, OR, (375) 383, 2001

Vaneman, W., Triantis, K., and Carayannis, E., "Embedding Data Envelopment Analysis into a System Dynamics Framework," *2000 Proceedings of the American Society for Engineering Management*, George Washington University, October 2000, 112-121.

Keywords:

Industry, Analysis, Ships, Advanced Technology, Mathematical Modeling

Naval Air Systems Command (NAVAIR)

Name:	Naval Air Systems Command Headquarters		
Address:	Cost Department (AIR-4.2), 21491 Great Mills Rd., Lexington Park, MD 20653		
Director:	Dave Burgess (301) 757-7810 Web site: http://www.navair.navy.mil/air40/air42/		
Size:	Professional:		
	NAVAIR HQ	47	
	NAWC-AD-LAKE	17	
	NAWC-AD-PAX	134	
	NAWC-WD-CL	17	
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:	1-2 years	
	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:	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:	NAVAIR 21491 Great Mills Rd. Lexington Park, MD 20653
Performer:	Tecolote, Inc.

Resources:	<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
	1999	\$50,000	
Schedule:	<u>Start</u>	<u>End</u>	
	May 1999	Jan 2000	
Database:	None		
Publication:	Technical Report		
Keywords:	Estimating, Analysis, Method, Data Collection, Mathematical Model		

NAVAIR-2

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.		
Classification:	Unclassified		
Sponsor:	NAVAIR 21491 Great Mills Rd. Lexington Park, MD 20653		
Performer:	Naval Air Warfare Center—Aircraft Division Lakehurst, New Jersey		
Resources:	<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
	1999	\$35,000	
	2000	\$7,000	
Schedule:	<u>Start</u>	<u>End</u>	
	May 1999	Mar 2000	
Database:	None		
Publication:	Technical Report		
Keywords:	Estimating, Analysis, Aircraft, Method, Data Collection, Mathematical Model		

NAVAIR-3

Title:	Cost Growth Analysis
Summary:	This task investigates the cost, technical, and programmatic 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 programs reported in the SAR. These data are being organized in a cost growth database. Technical and programmatic characteristics are also being recorded for various points within a program's lifecycle to analyze changes over time. These data are captured in an excel spreadsheet. The analysis will result in a conceptual approach for NAVAIR cost risk estimation.
Classification	Unclassified
Sponsor:	NAVAIR 21491 Great Mills Rd. Lexington Park, MD 20653

Performer: NAVAIR
21491 Great Mills Rd.
Lexington Park, MD 20653

Resources:

<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
2000	\$69,000	.5
2001	\$30,000	.2
2002	\$225,000	1.5
2003	\$255,000	1.7

Schedule:

<u>Start</u>	<u>End</u>
Mar 2000	Oct 2003

Database:

Title: NAVAIR Cost Growth Database

Description: NAVAIR aircraft, weapons, and avionics programs cost growth in Excel spreadsheets

Automation: Microsoft EXCEL

Publication: Technical Report

Keywords: Government, Analysis, Aircraft, Electronics/Avionics, Case Study, Study

NAVAIR-4

Title: Naval Aircraft Modification Model (NAMM) Update

Summary: This task includes updating OSIP cost information currently contained in NAMM and expanding 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: NAVAIR
21491 Great Mills Rd.
Lexington Park, MD 20653

Performer: NAVAIR
21491 Great Mills Rd.
Lexington Park, MD 20653

Resources:

<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
2002	\$0	.25
2003	\$0	.25

Schedule:

<u>Start</u>	<u>End</u>
June 2002	Sept 2003

Database:

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, Database

NAVAIR-5

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, and identifying future operation and maintenance costs.

Classification: Unclassified

Sponsor: NAVAIR
21491 Great Mills Rd.
Lexington Park, MD 20653

Performer: Tecolote, Inc.

Resources:	<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
	2000	\$70,000	.5
	2001	\$50,000	.5
	2002	\$80,000	.8
	2003	\$50,000	.5
	2004	\$50,000	.5

Schedule:	<u>Start</u>	<u>End</u>
	Apr 2000	Sept 2004

Database: None

Publication: Technical Report, Model

Keywords: Estimating, Analysis, Aircraft, Mathematical Model

NAVAIR-6

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: NAVAIR
21491 Great Mills Rd.
Lexington Park, MD 20653

Performer: Ketron

Resources:	<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
	1999	\$75,000	
	2000	\$50,000	

Schedule:	<u>Start</u>	<u>End</u>
	Apr 1999	Jul 2000

Database: None

Publication: Technical Report, Model

Keywords: Analysis, Economic Analysis, Aircraft

NAVAIR-7

Title: Avionics Database

Summary: Development continues on this database of historical avionics cost, technical, and programmatic information. The database aims to provide complete avionics system data in a user-friendly format. Standard but flexible WBS based templates allow users to view data in varying levels of detail.

Classification Unclassified

Sponsor: NAVAIR
21491 Great Mills Rd.
Lexington Park, MD 20653

Performer: NAVAIR
21491 Great Mills Rd.
Lexington Park, MD 20653

Resources:

<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
2000	\$100,000	.75
2001	\$100,000	.75
2002	\$100,000	.75
2003	\$100,000	.75
2004	\$100,000	.75

Schedule:

<u>Start</u>	<u>End</u>
Dec 1999	Jul 2004

Database:

Title: Avionics Database

Description: Cost, technical, and programmatic data for historical avionics programs including IR, EO-IR, Communication/Navigation, Radar, Inst/Proc

Automation: TBD

Publication: Technical Report—Database Documentation

Keywords: Data Collection, Electronics/Avionics, Database

NAVAIR-8

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: NAVAIR
21491 Great Mills Rd.
Lexington Park, MD 20653

Performer: NAVAIR
21491 Great Mills Rd.
Lexington Park, MD 20653

Resources:

<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
2000	\$100,000	.75
2001	50,000	.3
2002	\$100,000	.75
2003	\$50,000	.5

Schedule:

<u>Start</u>	<u>End</u>
Dec 1999	Mar 2003

Database: *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: Helicopters, Data Collection, Database

NAVAIR-9

Title: Propulsion Database
Summary: A database of historical propulsion cost, technical, and programmatic data was developed. The database responds to ad hoc queries and to provide standard format reports.
Classification Unclassified
Sponsor: NAVAIR
 21491 Great Mills Rd.
 Lexington Park, MD 20653
Performer: NAVAIR
 21491 Great Mills Rd.
 Lexington Park, MD 20653
Resources: FY Dollars Staff-years
 2000 \$100,000 .75
 2001 30,000 .2
 2002 50,000 .4
Schedule: Start End
 Dec 1999 June 2002
Database: *Title:* Propulsion Database
 Description: Cost, technical, and programmatic data for historical propulsion programs.
 Automation: Microsoft ACCESS
Publication: Technical Report—Database Documentation
Keywords: Data Collection, Aircraft, Propulsion, Data Collection, Database

NAVAIR-10

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: NAVAIR
 21491 Great Mills Rd.
 Lexington Park, MD 20653

Performer: Naval Air Warfare Center—Aircraft Division
Lakehurst, NJ 08733

Resources: FY Dollars Staff-years
2000 \$130,000

Schedule: Start End
Dec 1999 Oct 2000

Database: None

Publication: Validation Report, Software User's Manual

Keywords: Analysis, Environment, Study

NAVAIR-11

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 Division
China Lake, CA 93556

Performer: Naval Air Warfare Center—Weapons Division
China Lake, CA 93556

Resources: FY Dollars Staff-years
1999 \$150,000 1.0 MMC
1999 \$200,000 1.4 JDAM PIP

Schedule: Start End
Aug 1999 Sep 2000 MMC
Oct 1999 Aug 2000 JDAM PIP

Database: None

Publication: Cost Analysis section of technical report.

Keywords: Government, Analysis, Weapon Systems, Mathematical Model

NAVAIR-12

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: NAVAIR
21491 Great Mills Rd.
Lexington Park, MD 20653

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

Resources:

<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
1999	\$87,000	.8
2001	\$75,000	.7
2002	\$75,000	.7
2003	\$75,000	.7

Schedule:

<u>Start</u>	<u>End</u>
Nov 1999	Oct 2003

Database:

Title: Missile Database

Description: Missile cost, technical, and programmatic data.

Automation: Microsoft ACCESS application

Publication: Functional Requirements, System Specifications

Keywords: Missiles, Data Collection, Database, CER

NAVAIR-13

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. The cost risk methodology will be integrated with the NAVAIR Risk Management process.

Classification: Unclassified

Sponsor: NAVAIR
21491 Great Mills Rd.
Lexington Park, MD 20653

Performer: NAVAIR and Northrop Grumman/TASC

Resources

<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
2000	\$70,000	.5
2002	\$90,000	1.0
2003	\$90,000	1.0

Schedule:

<u>Start</u>	<u>End</u>
Apr 2001	Sept 2003

Database: Cost Growth Database will support Cost Risk Model.

Publication: Technical Report

Keywords: Analysis, Aircraft, Risk/Uncertainty, Method

NAVAIR-14

Title: Software Cost and Schedule Estimating - SBIR (Small Business Innovative Research) N01-020 Phase II

Summary: Effort to develop next generation of software cost and schedule estimating models and algorithm's for all phases of the life cycle. Emphasis is on methods that yield increased accuracy, easier use, and enhancements to the ability of the models to justify the results and thus increase the results believability to the decision maker. There are two independent developers working on separate implementations of this effort.

Classification: Contractor Sensitive, although the Government will have data rights to the product

Sponsor: NAVAIR
21491 Great Mills Rd.
Lexington Park, MD 20653

Performer: Galorath, Inc.
100 North Sepulveda Blvd Suite 1801
El Segundo, CA 90245
Technomics, Inc.
5290 Overpass Rd Suite 206
Santa Barbara, CA 93111-2051

Resources N68335-02-C-0385, \$1,124,765.73—Galorath
N68335-02-C-0386, \$1,120,137—Technomics

Schedule: Start End
May 2002 May 2004—Galorath
Feb 2002 Feb 2004—Technomics

Database: None

Publication: Technical Report

Keywords: Government, Estimating, Life Cycle, Software, Mathematical Model

NAVAIR-15

Title: Installation Optimization and ECP/Modification Cost Trade-off Model

Summary: The model was developed in response to requirements identified by the Installation/Modification and ECP Business Process Reengineering (BPR) Teams. Specifically, the model helps users to develop optimal kit acquisition and installation plans (Installation Optimization Module) or to evaluate the potential cost avoidance of a proposed ECP or modification (ECP/Modification Cost Trade-off Module). The model was created primarily because there was no standard method for estimating the life cycle costs of ECPs, modifications, or OSIPs. Potential users include APMLs, Configuration Managers, Fleet Support Team members, Budget Analysts, Supply Managers, and Cost Analysts. The final operational model will be completed by the end of FY03.

Classification: Unclassified

Sponsor: NAVAIR (AIR 1.0; 3.1.8; and 4.2)
21491 Great Mills Rd.
Lexington Park, MD 20653

Performer: Ketron

Resources FY Dollars
2001 \$175,000
2003 \$100,000

Schedule: Start End
Schedule: Feb 2001 Jul 2001—Prototype
Sep 2001 Jul 2002—Draft Operational
Apr 2003 Sep 2003—Final Operational

Database: None

Publication: User Manual/Technical Report

Keywords: Government, Estimating, Mathematical Model

NAVAIR-16

Title: Aircraft Integration & Certification Cost Model

Summary: The work in the aircraft integration area consisted of developing a database and cost estimating relationships (CERs) to estimate the development and production costs of aircraft integration programs. The final product will be a PC-based software cost model containing all of the data and equations necessary for a cost analyst to estimate the costs of a Navy aircraft integration project. The software will contain five modules which address specific blocks of aircraft integration and certification considerations including: (1) Contractor Platform Integration; (2) Software Development; (3) Government Development Test and Support; (4) Government Airworthiness Test and Support; and (5) Weapon Integration. Cost analysts and program managers within Navy program offices will use this model to develop early estimates of aircraft integration projects and to help establish budgets for these projects. Commercial applications of this model include use by the prime contractors responsible for performing the aircraft integration work.

Classification: Unclassified

Sponsor: NAVAIR (AIR 4.2)
21491 Great Mills Rd.
Lexington Park, MD 20653

NAVAIR (AIR 4.5)
21960 Nickles Road, Hanger 201
Lexington Park, MD 20670

Performer: Technomics, Inc.

Resources:	<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
	2000	\$40,000	0.3
	2001	\$223,000	1.7
	2002	\$240,000	1.8
	2003	\$240,000	1.8

Schedule:	<u>Start</u>	<u>End</u>
	Jun 2000	Jun 2003

Database: None

Publication: Technical Report

Keywords: Government, Aircraft, SD&D, Production, Integration, Data Collection, Data Base, CER

Naval Sea Systems Command (NAVSEA)

Name:	Cost Engineering and Industrial Analysis Division, Comptroller Directorate Naval Sea Systems Command		
Address:	1333 Isaac Hull Ave., SE, Washington Navy Yard, DC 20376-1340		
Director:	Barbara A. Young, (202) 781-0959		
Size:	Professional:	54	
	Support:	1	
	Consultants:	0	
	Subcontractors:	4	
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 five years. The results are grouped according to Ship Work Breakdown Structure (SWBS) Cost Groups 1-9, and indices are calculated.		
Classification:	Unclassified		
Sponsor:	NAVSEA (SEA 017C) 1333 Isaac Hull Ave., SE Washington Navy Yard, DC 20376-1340 Morris Fields, (202) 781-2709; DSN: 326-2709		
Performer:	Naval Shipyard Norfolk Detachment NAVSEA Shipbuilding Support Office 3751 Island Avenue, 3rd Floor Philadelphia, PA 19153 Joe Neumann (215) 365-5767, ext 218		
Resources:	<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
	Each year	\$125,000	
Schedule:	<u>Start</u>	<u>End</u>	
	Oct each year	Sep each year	
Database:	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: 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 (PMS 400F)
1333 Isaac Hull Ave., SE
Washington Navy Yard, DC 20376

Performer: Naval Sea System Command
Crane Division (Code 604)
300 Hwy 361
Crane, IN 47522-5060

Resources:

<u>FY</u>	<u>Dollars</u>
1999	\$200,000
2000	\$100,000
2001	\$250,000
2002	\$285,000

Schedule:

<u>Start</u>	<u>End</u>
Oct 1998	Oct 2003

Database: 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, Electronics/Avionics, SD&D, Production, Operations and Support, Labor, Material, Engineering, Acquisition Strategy, Risk/Uncertainty, Sustainability, Modification, Data Collection, Survey, Database, Computer Model

Naval Surface Warfare Center, Dahlgren Division (NSWCDD)

Name:	Cost & Affordability Branch, Code T51 Warfare Analysis Division, Code T50 Naval Surface Warfare Center, Dahlgren Division (NSWCDD)		
Address:	17320 Dahlgren Road, Dahlgren, VA 22448-5100		
Director:	Amanda Cardiel		
Size:	Professional:	14	
	Support:	1	
	Consultants:	0	
	Subcontractors:	1	
Focus:	The Cost and Affordability Branch resides within the Theater Warfare Systems Department at NSWCDD. The branch is responsible for providing cost estimation, budget and affordability analysis, and methodology development in support of system development programs, analyses of alternatives, and strategic planning. Particular areas of expertise and emphasis include developing and maintaining models, databases, and procedures for performing these functions, technology assessments, life cycle cost estimates, budget and force-level analyses, performance-based cost models, and product-oriented cost models. The current focus of the NSWCDD cost research program is: verification, validation, and upgrading of models developed for complex surface navy radar and missile systems during the development and production phases of a program.		
Activity:	Number of projects in process:	2	
	Average duration of a project:	2 years	
	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:		
	Percentage of effort conducted by subcontractors:	100%	

NSWCDD-1

Title:	Radar Cost Model
Summary:	This effort is directed towards the development of CERs to estimate the engineering development and production costs associated with the major components of a solid-state radar. The CER development will be predicated by building a cost database of currently existing military radar development and production programs. The CERs will be implemented in an EXCEL spreadsheet model.
Classification:	Unclassified (Proprietary)
Sponsor:	NSWCDD (Code T51) Dahlgren Division Dahlgren, Virginia 22448-5100
Performer:	NSWCDD (Code T51) Dahlgren Division Dahlgren, Virginia 22448-5100 Roxanne N. Harvey, (540) 653-8092 Amanda J.A. Cardiel, (540) 653-5235 Technomics, Inc. John Horak, (805) 964-9894

Resources: FY Dollars Staff-years
2000–02 \$250,000

Schedule: Start End
Sep 2000

Database: A newly created database from various Navy, Air Force and Army radar development and production programs deemed relevant to current technology radars. CERs will be developed to estimate the costs of fixed array radars, composed of solid-state T/R modules, as well as for the more traditional dish radars.

Publications: TBD

Keywords: Government, Estimating, SD&D, Production, Data Collection, Mathematical Model, CER

NSWCDD–2

Title: Missile Cost Model Version 3.15

Summary: This effort was directed towards the development of CERs to estimate the contractor engineering development and production missile costs. The CER development was predicated by the building of a cost database of currently existing military missile development and production programs. The CERs were implemented in an EXCEL spreadsheet model. This model is an update to the TBMD Missile Model completed in September 1997.

Classification: Unclassified (Proprietary)

Sponsor: NSWCDD (Code T51) Dahlgren Division
Dahlgren, Virginia 22448-5100

Performer: NSWCDD (Code T51) Dahlgren Division
Dahlgren, Virginia 22448-5100
Shelly A. Carney, (540) 653-1321
Amanda J. A. Cardiel, (540) 653-5235
Danna Bowman, (540) 653-1339
Technomics, Inc.
John Horak, (805) 964-9894

Resources: FY Dollars Staff-years
1999–02 \$180,000

Schedule: Start End
Sep 1999 Jan 2003

Database: A newly created database from various Navy, Air Force and Army missile development and production programs that were deemed to be relevant to current technology missiles. CERs were developed to estimate the costs of all missile sub-systems and/or at the assembly level. Besides hardware costs and hardware integration costs, CERs are used to estimate contractor: non-recurring development; non-recurring production; development support; and procurement support.

Publications: TBD

Keywords: Government, Estimating, Missile, SD&D, Production, Data Collection, Mathematical Model, CER

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:	Scott "Gus" Gustavson, (301) 227-5479 E-mail: gustavsonse@nswccd.navy.mil		
Size:	Professional:	16	
	Support:	1	
	Consultants:	0	
	Subcontractors:	4	
Focus:	The Cost and Economic Analysis Office provides cost estimating support, performs budget and affordability analysis, provides support for analyses of alternatives, and performs cost model research and development. Particular areas of expertise and emphasis include developing and maintaining models, life cycle cost estimates, operating and support cost estimates, independent cost estimates, technology assessments, performance-based cost models, and product-oriented cost models. Recent projects are tending more toward support of major acquisition programs for NAVSEA, and Independent Cost Estimates for NCCA, rather than research oriented.		
Activity:	Number of projects in process:	10	
	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:	LEAPS Cost Support; Update
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:	Robert Ames, NSWCCD Code 26, (301) 227-3657 E-mail: amesrm@nswccd.navy.mil Bruce Wintersteen, NSWCCD Code 26, (301) 227-1178 E-mail: wintersttenbd@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
 Scott Gustavson, (301) 227-5479; DSN: 287-5479
 Kathy Stanley, (301) 227-3633; DSN: 287-3633

Resources:

<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
2000	\$50,000	0.3
2001	\$25,000	0.2
2003	TBD	

Schedule:

<u>Start</u>	<u>End</u>
April 2000	Sep 2000—Cost Model Inventory
April 2000	Sep 2000—Input variable list and definitions
April 2000	Sep 2000—Output information list and definitions
April 2000	Sep 2001—IPT participation
April 2000	Sep 2001—Focus object model development
April 2000	Oct 2001—Document Results
May 2003	Oct 2003—Updates as necessary

Database: 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–2

Title: Flexible Tool for Assessing Ship Cost (Flex-TASC)

Summary: A spreadsheet tool that combines two NSWC-CD developed models: Model for Assessing Cost of High Speed Ships (MACHSS) and Small Boat Performance Based Cost Model (Small Boat PBCM). For small high-speed ships, it: predicts unit production costs reasonably well for early-design tradeoffs, produces repeatable output, and provides costing method flexibility and promotes configuration control. It allows ship designers to receive real-time cost feedback for design trade-off decisions.

Classification: Unclassified

Sponsor: NSWC-CD Innovation Cell for High Speed Small Naval Combatants
 West Bethesda, MD
 Kelly Malkin (301) 227-0293

Performer: Kelly Malkin (301) 227-0293

Resources:

<u>FY</u>	<u>Dollars</u>	<u>Staff-year</u>
2003	\$40,000	0.25

Schedule:

<u>Start</u>	<u>End</u>
FY03	FY03

Database: Resident within cost model

Publications: None

Keywords: Government, Estimating, Ships, Mathematical Model

Air Force Cost 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:	53 (authorized); 46 (assigned)	
	Support:	5	
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:	18	
	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 Enhancements	
Summary:	ACE-IT The purpose of this project is to continue to upgrade the capabilities of ACE-IT. Current enhancements will include narrative reporting improvements, a variable pick list and integration with Word providing a simplified method for creating custom user narrative templates along with an interface to easily interact with ACE for definition edits.	
Classification:	Unclassified	
Sponsor:	Air Force Cost Analysis Agency, Research and Resource Management Division Ms. Janice Hughes, (703) 602-8148; DSN 332-8148 E-mail: Janice.Hughes@pentagon.af.mil	
Performer:	Tecalote Research, Inc.	
Resources:	<u>FY</u>	<u>Dollars</u>
	1993-95	\$646,000—Enhancements
	1996-98	\$410,000—Enhancements
	1999	\$170,000—Enhancements
	2000	\$220,000—Enhancements
	2002	\$125,000—Enhancements
	2003	\$125,000—Enhancements
Schedule:	<u>Start</u>	<u>End</u>
	Jan 1997	Complete—Enhancements
	Oct 1998	Jun 2003—Enhancements
Database:	N/A	
Publications:	ACE-IT user manuals and supporting documentation	

Keywords: Government, Analysis, Estimating, Aircraft, Airframe, SD&D, Production, Database, Industry, Weapon Systems, Life Cycle, Method, Computer Model

AFCAA-2

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

Summary: The objective of this project is to normalize and fully document 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 contains functional hourly and cost information as well as technical information for each hardware WBS element. Sources of data and normalization rationale are completely documented. Throughout the effort data is being added to repair holes in the material costs of various aircraft and ensure the material costs are accurate and complete. Data has also been added for purchased equipment. FY03 effort is focusing on collecting and normalizing incoming data on newer programs, i.e., F-22 and F/A-18E/F, providing learning curve analysis on F/A-18 and F-15, collecting Price Bill of Material cost data and providing verification and validation of old platforms.

Classification: Unclassified

Sponsor: Air Force Cost Analysis Agency, Research and Resource Management Division
Ms. Janice Hughes, (703) 604-8148; DSN 664-8148
E-mail: Janice.Hughes@pentagon.af.mil

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

Resources:

<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
1993	\$100,000—Phase I	
1996	\$225,000—Phase II	
1997	\$25,000—Phase III	
1999	\$80,000—Phase IV	
2000	\$120,000—Phase V	
2001	\$119,000—Phase VI	
2002	\$100,000—Phase VII	
2003	\$126,000—Phase VIII	

Schedule:

<u>Start</u>	<u>End</u>
Phases I–VII	Complete
Phase VIII	Sep 2003

Database: Excel (pivot tables)

Publications: Written report and data dictionary.

Keywords: Government, Analysis, Estimating, Aircraft, Airframe, SD&D, Production, Labor, Material, Data Collection, Database

AFCAA-3

Title: NAFCOM (NASA/Air Force Cost Model)

Summary: The purpose of this project is to develop and integrate 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. The model includes phasing, risk analysis, and further generation of complexity factors and development of sound methodologies for separating hardware and software costs. A tool has been added allowing searches of and export of the data for analysis. Phase VI reviewed assumptions used for and statistical

validity of CERs and provided AFCAA with cost model technical support and updated model documentation.

Classification: Unclassified

Sponsor: Air Force Cost Analysis Agency, Research & Resource Management Division
Ms. Janice Hughes, (703) 604-8148; DSN 664-8148
E-mail: Janice.Hughes@pentagon.af.mil

Performer: SAIC

Resources:	<u>FY</u>	<u>Dollars</u>
	1996	\$150,000—Phase I
	1997	\$150,000—Phase II
	1998	\$150,000—Phase III
	1999	\$150,000—Phase IV
	2000	\$160,000—Phase V
	2001	\$100,000—Phase VI

Schedule: Start End
Phases I–VI Complete

Database: NAFCOM Database

Publications: Normalized Database and NAFCOM Documentation

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

AFCAA-4

Title: Air Force Total Ownership Cost (AFTOC) Management Information System

Summary: AFTOC is an unclassified management information system that receives data from many Air Force legacy data systems and produces consistent and reliable information about Air Force weapon systems and infrastructure. Mission costs are reported by system (aircraft, space systems, munitions, and some C3I) while infrastructure costs can be viewed by functional category (supply operations, mission operation, MILCON, etc.). Additionally, supply transaction detail (National Stock Number, MSD and GSD) is available for major aircraft and space systems as well as for many subsystems. Munition and small missile expenditure costs can also be found in AFTOC. Cost detail can be found by program element, appropriation, EEIC, and RC/CC to name a few. For registered users, standard data products are available on the AFTOC web site and a user accessible multidimensional database can be reached through CITIRX. The registration page can be found at <https://aftoc.hill.af.mil>. Current development activities include completion of the back-end reengineering and the fielding of a new front-end user interface called COGNOS.

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, Northop Grumman--TASC, and OO-LC/MASMC

Resources:	<u>FY</u>	<u>Dollars</u>
	1998	\$2.0M—Phase I
	1999	\$3.9M—Phase II & III
	2000	\$3.7M—Phase IV
	2001	\$3.6M—Phase V

	2002	\$3.3M—Phase VI
	2003	\$3.0M—Phase VII
Schedule:	<u>Start</u>	<u>End</u>
	Dec 97	Complete—Initial Development
	Oct 00	Complete—Validation
	Oct 01	Complete—Expansion
	Oct 02	Sep 03—Reengineering
	Oct 03	Sep 04—Revalidation
Database:	SQL Server 2000	
Publications:	Metadata files.	
Categories:	II.A.2, II.C	
Keywords:	Government, Reviewing/Monitoring, Aircraft, Space Systems, Missiles, Operations and Support, Data Collection, Database, Infrastructure, Spares/Logistics	

AFCAA-5

Title: Air Force Inflation Model and Tutorial

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. A custom generator report feature and update to the tool for new inflation indices is contained in the model. The FY03 effort will update the annual inflation indices as well as support upgrades in Microsoft Windows and Excel. In FY04 the requirement will update the inflation indices as well as revise programming as necessary for compatibility with current updates of Microsoft Office. Development will continue on a conversion module allowing analysts to download spreadsheets to facilitate conversions.

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: FY 97-98 TASC
FY 99-03 Center for Systems Management, Inc.

Resources:

<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
1997	\$41,000	
1998	\$46,000	
1999	\$20,000	
2000	\$16,000	
2001	\$16,000	
2002	\$25,000	
2003	\$16,000	
2004	\$25,000	

Schedule:

<u>Start</u>	<u>End</u>
Oct 1996	Ongoing

Database: Excel

Publications: N/A

Keywords: Government, Estimating, Analysis, Database, Mathematical Modeling, Computer Model

AFCAA-6

Title: Aircraft Avionics Systems Database and Study

Summary: The objective of this effort is to develop an avionics database that will provide cost estimating relationships for both federated and next-generation integrated avionics systems and making a bridge between those systems. An extensive data collection effort has been accomplished and data has been updated. The contractor developed a supportable methodology to estimate integrated avionics systems through CERs supporting the development, production and integration phases of systems. FY03 will again collect the most recent data and attempt to provide CERs and technical consulting for estimating the rapidly changing acquisition costs of avionics programs.

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:

<u>FY</u>	<u>Dollars</u>
1999	\$212,000
2000	\$125,000
2001	\$100,000
2002	\$137,000

Schedule:

<u>Start</u>	<u>End</u>
Mar 1999	Complete
Mar 1900	Complete
Mar 2001	Complete
May 2002	May 2003

Database: Excel

Publications: Final Report

Keywords: Government, Analysis, Electronics/Avionics, SD&D, Production, Labor, Material, Data Collection, Database

AFCAA-7

Title: Performance Activated COTS Electronics Relationships (PACER) (Formerly COTS Electronics Database/Modeling)

Summary: The purpose of this database is to quantify COTS hardware costs encompassing different ruggedization levels as well as risk parameters. 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. These improvements will allow the analyst to provide augmentation to design-to-cost analyses regarding system hardness capabilities of a design using COTS components. The model is capable of predicting integration and other programmatic support costs encountered in COTS programs. Data associated with AIS/C3I systems has been collected and includes hardware electronic components as well as various levels of non-hardware components. In FY03 emphasis will be placed on collecting new potential technologies on commercial electronics, creating statistical relationships, and on using technical performance specifications or parameters to estimate commercially available equipment pricing. Additionally, it will include ground antenna systems as a new COTS type.

Classification: Unclassified

Sponsor: Air Force Cost Analysis Agency, Research and Resource Management Division
Ms. Janice Hughes, (703) 602-8148; DSN 332-8148
E-mail: Janice.Hughes@pentagon.af.mil

Performer: Mission Research Corp. (MRC)

Resources:

<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
1999	\$80,000	
2000	\$17,000	
2001	\$225,000	
2002	\$215,000 (Air Force, Army, Navy)	
2004	\$350,000	

Schedule:

<u>Start</u>	<u>End</u>
Sep 1999	Complete
Mar 2002	Complete
Sep 2002	Sep 2003
Sep 2003	Sep 2004

Database: Excel

Publications: Final Report

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

AFCAA-8

Title: Cost Factor Model Support

Summary: The purpose of this project is to support the development of the Air Force Planning Projection model outlining the future force structure using Total Ownership Cost models on 50+ weapon systems. 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. FY03 tool development captured AFI 65-503 revisions.

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:

<u>FY</u>	<u>Dollars</u>
2001	\$150,900
2003	\$150,000

Schedule:

<u>Start</u>	<u>End</u>
Nov 2000	Complete
Feb 2002	Complete

Database: Access / Excel

Publications: Final Report

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

AFCAA-9

Title: Aircraft and Aircraft Modification Sufficiency Review Handbook

Summary: The objective of this project is to update the Air Force Cost Analysis Agency (AFCAA) resources and guidelines for performing sufficiency reviews of Analyses of Alternatives (AoAs), Program Office Estimates (POEs), and any other items requiring a sufficiency review by creating a handbook and providing cost analysis assistance. The FY03 effort will focus on data collection, documentation and metrics that can be used to crosscheck estimates for aircraft and aircraft modification programs.

Classification: Unclassified

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

Performer: RAND

Resources:

<u>FY</u>	<u>Dollars</u>
2001	\$175,000
2002	\$175,000
2004	\$175,000

Schedule:

<u>Start</u>	<u>End</u>
Apr 2001	Complete
Jun 2002	Sep 2003
Oct 2003	Sep 2004

Database: Access/Excel

Publications: User Handbook

Keywords: Government, Estimating, Analysis, Modification, Risk/Uncertainty, SD&D, Aircraft, Weapon Systems, Production, WBS, CER, Cost Progressive Curve, Methodology, Statistics/Regression, Data Collection, Electronics/Avionics

AFCAA-10

Title: Long Range Planning Cost Analytical Support

Summary: The objective of this task is to provide skilled analytic support services to assist with projecting long term financial requirements including the assessment of acquisition, direct mission and indirect support costs. Iterations update and expand the long-range planning models for the Air Force Capability Investment Strategy (AFCIS). The FY03 effort includes a C-17 Cost Benefit Analysis Sufficiency Review. The FY04 effort while supporting the AFCIS, will also focus on force structure roadmaps, weapon system recapitalization studies, sufficiency review of weapon systems O&S estimates, build models/databases and conduct "what-if" analysis.

Classification: Unclassified

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

Performer: SAIC—FY02
LMI—FY03

Resources:

<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
2002	\$150,000	
2003	\$205,000	
2004	\$280,000	

Schedule: Start End
 Mar 2002 Complete
 Jan 2003 Jan 2004
 Jan 2004 Jan 2005

Database: Excel

Publications: Updated models and Final Documentation

Keywords: Industry, Government, Analysis, Programming, Weapon Systems, Missiles, Operations and Support, Life Cycle, Training, Sustainability, Data Collection, Database

AFCAA-11

Title: Measuring ROI for R&M Investments

Summary: The objective of the study was to quantify the impact of prior, current and future Air Force R&M modifications by R&M primary purpose and by aircraft weapon system; develop and quantify the impact on future Air Force aircraft operating and support costs through collection of historic data and development of cost models, algorithms, etc. In addition, the project addressed projected cost increases or savings estimated with timeframes associated with R&M modifications and attempted to determine if the estimated costs or saving had materialized.

Classification: Unclassified

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

Performer: SAIC

Resources: FY Dollars
 02 \$150,000

Schedule: Start End
 Aug 02 Complete

Database: Excel/Access

Publications: Final Documentation

Keywords: Government, Estimating, Analysis, Reviewing/Monitoring, Policy, Programming, Budgeting, Forces, Weapon Systems, Labor, Material, Overhead/Indirect, Engineering, Manufacturing, Fixed Costs, Variable Costs, Advanced Technology, Risk/Uncertainty, Readiness, Sustainability, Modification, Schedule, Mathematical Modeling, Cost/Production Function, Time Series, Statistics/Regression, Database, Computer Model, CER, Study

AFCAA-12

Title: Automatic Update of AFI 65-503 with AFTOC database

Summary: The purpose of this project is to research and develop methodologies for using the data contained in the Air Force Total Ownership Cost (AFTOC) management information system to produce cost factors contained in AFI 65-503. Each factor table in AFI 65-503 will be reviewed for data requirements and compared with data available in AFTOC. If sufficient data exists in AFTOC then methodologies will be developed to automatically produce the table on an annual basis. The research will determine if new factors can now be developed to help analysts and programmers produce more complete and comprehensive analyses. The FY04 effort will automate the methodology used to build AFI 65-503 tables and provide the capability to query, retrieve/and download current and prior tables simultaneously, provide web hot links to select table references where available, improving visual appearance, consistency and appeal of Table formats.

Classification: Unclassified

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

Performer: Battelle Memorial Institute

Resources:

<u>FY</u>	<u>Dollars</u>
2002	\$99,000
2003	\$80,000

Schedule:

<u>Start</u>	<u>End</u>
Jun 2002	Jun 2003
Oct 2003	Sep 2004

Database: Excel

Publications: Model, User Documentation and Final Documentation

Keywords: Industry, Government, Analysis, Programming, Budgeting, Forces, Weapon Systems, Aircraft, Helicopters, Missiles, Airframe, Propulsion, Spares/Logistics, Facilities, Infrastructure, Manpower/Personnel, Operations and Support, Life Cycle, Training, Sustainability, Data Collection, Database

AFCAA-13

Title: Aircraft Software Data Track

Summary: This project will collect software cost metrics from historical and current aircraft programs. Metrics may include Source Lines of Code (SLOC), reuse assessment, language, hours required for the individual development phases, calendar time required for the individual development phases, the development platform, and dollars required to complete the development.

Classification: Unclassified

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

Performer: Tecolote Research, Inc.

Resources:

<u>FY</u>	<u>Dollars</u>
2002	\$74,410

Schedule:

<u>Start</u>	<u>End</u>
May 2002	May 2003

Database: Excel

Publications: Final Documentation

Keywords: Industry, Government, Analysis, Weapon Systems, Aircraft, Software, Data Collection, Database, Estimating, Electronics/Avionics, Engineering, Manufacturing, Variable Costs, Advanced Technology, Risk/Uncertainty, Reliability, Sustainability, Modification, Mathematical Modeling, Statistics/Regression, Method, CER, Study

AFCAA-14

Title: Ground Satellite System Architecture

Summary: The objective of this effort is to assist AFCAA in understanding the architectural design of ground satellite systems as well as depict various technical parameters for desired performance. Such understanding will enable cost analysts to review cost analysis

requirements descriptions for completeness as well as develop reasonable and sound independent cost estimates.

Classification: Unclassified

Sponsor: Air Force Cost Analysis Agency, Research and Resource Management Division
Ms. Janice Hughes, (703) 602-8148; DSN 332-8148
E-mail: Janice.Hughes@pentagon.af.mil

Performer: Mission Research Corp.

Resources: FY Dollars
2002 \$129,000

Schedule: Start End
Aug 2002 Aug 2003

Database: Excel/Access/Visual Basic

Publications: Final Report

Keywords: Industry, Government, Analysis, Programming, Weapon Systems, Missiles, Operations and Support, Life Cycle, Training, Sustainability, Data Collection, Database

AFCAA-15

Title: USCM/PSCM Unmanned Space Cost Model and Passive Sensor Cost Models

Summary: The purpose of this project is to collect data for estimating space sensor payloads (passive sensors, e.g., infrared) and estimate the cost of a spacecraft and a communication payload at the subsystem and component level. Sensor data collection will be at the subsystem level. These two models will be integrated into one model. The model will retain the name of Unmanned Space Cost Model.

Classification: Unclassified

Sponsor: Air Force Cost Analysis Agency, Research and Resource Management Division
Ms. Janice Hughes, (703) 602-8148; DSN 332-8148
E-mail: Janice.Hughes@pentagon.af.mil

Performer: Aerospace Corporation

Resources: FY Dollars
2002 \$100,000
2003 \$62,000
2004 \$100,000

Schedule: Start End
Jun 2002 Dec 2002
Nov 2003 Oct 2004
TBD TBD

Database: Access/Excel

Publications: Final Report

Keywords: Government, Estimating, SD&D, Space Systems, Production, WBS, CER, Statistics/Regression, Database, Data Collection, Mathematical Model, Electronics/Avionics

AFCAA-16

Title: Assessing Cost Reduction Initiatives and Return on Investment for DoD Weapon System Programs

Summary: The objective of the project is to assess the current industry and government methods used to determine return on investment for cost reduction initiatives (CRIs); evaluate existing CRI evaluation tools; and provide an assessment of the best tools for cost estimators to use; and/or develop new ways to analyze proposed investments on existing or future programs. The project will determine what tools may be available or can be developed so that cost analysts and other acquisition personnel can better assess and predict the effectiveness of future CRIs with greater confidence. The project's focus is on current military aircraft production programs.

Classification: Unclassified

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

Performer: RAND

Resources:

<u>FY</u>	<u>Dollars</u>
2002	\$125,000
2004	\$150,000

Schedule:

<u>Start</u>	<u>End</u>
Jun 2002	June 2003
Nov 2003	Oct 2004

Database: Access/Excel

Publications: Final Report

Keywords: Government, Estimating, Analysis, Risk/Uncertainty, Weapon Systems, Production, CER, Method, Statistics/Regression, Data Collection, Manufacturing, Variable Costs, Acquisition Strategy, Study

AFCAA-17

Title: Develop CPFH Contingency Calibration Factors

Summary: The objective of the project is to develop CPFH factors that represent Contingency operations; and develop the capability to normalize historical data that reflects contingency operations to a peacetime scenario. This study funds cost factors as well as the development of marginal cost factors that measure the incremental costs in weapon system changes. In FY04 this effort will add anticipated wartime data from the Iraq crisis and refine the methodology as well as develop a method to forecast spares CPFH in an anticipated contingency.

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: LMI

Resources:

<u>FY</u>	<u>Dollars</u>
2002	\$80,000
2004	\$150,000

Schedule:

<u>Start</u>	<u>End</u>
Mar 2003	Mar 2004
Mar 2004	Mar 2005

Database: Access/Excel

Publications: Final Report

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

AFCAA-18

Title: Firm Fixed Price Contract Study

Summary: The objective of the project is to make recommendations on approaches to estimate costs and prices for follow-on Firm Fixed Price (FFP) production contracts (whether sole source or competitively awarded follow-on efforts) based on validated historical contractual information from Engineering Manufacturing Development (EMD) contracts and Production contracts with options. The FY04 effort will include an effort to estimate costs and prices on Engineering Change Orders on contracts.

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: Technomics

Resources:	<u>FY</u>	<u>Dollars</u>
	2002	\$100,000
	2003	TBD
	2004	TBD

Schedule:	<u>Start</u>	<u>End</u>
	Sep 2002	Sep 2003
	TBD	TBD
	TBD	TBD

Database: Access/Excel

Publications: Final Report

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

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

Name:	Aeronautical Systems Center, Air Force Material Command Acquisition Cost Division, Comptroller Directorate		
Address:	ASC/FMC, Building 14, Room 134, 1865 4th Street, Wright-Patterson AFB, OH 45433-7123		
Director:	Ms. Kathy A. Ruffner, (937) 255-6483 E-mail: Kathy.Ruffner@wpafb.af.mil		
Size:	Professional:	30	
	Support:	3	
	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:	12 months	
	Average number of staff members assigned to a project:	4	
	Average number of staff-years expended per project:	2	
	Percentage of effort conducted by consultants:	80%	

ASC/FMC-1

Title:	Cost Estimates Community of Practice (CoP)
Summary:	The Cost Estimates CoP (https://afkm.wpafb.af.mil/ASPs/CoP/CostCoP.asp?Filter=OO-FM-CE) is a “yellow pages” for cost analysts supplemented by web-enabled collaboration tools. The aim of the CoP is to improve the credibility of cost analysis products, while simultaneously cutting cycle time. This is done by providing efficient “one stop shop” Web-enabled access to: data, information, and expert knowledge. The CoP Web Site is organized around 10 product/process areas: Activity Based Cost/Management, Acquisition Costing, Business Case Analysis, Contract Reviews, Earned Value Analysis/Management, Education and Training, Economic Analysis, Source Selection, Scheduling and Professional Communities and Conferences. Each product/process area is further subdivided by interest areas. Planned future enhancements include: instant messaging, audiovisual conferencing, and an on-line cost library. The Cost Estimate CoP is championed by SAF/FMC and the next Steering Group meeting is planned for June 03.
Classification:	Unclassified
Sponsor:	ASC/FMCE Mr. Michael Seibel (937) 656-5458 Ms. Sandy McCardle (937) 255-7157
Performer:	Northrop-Grumman Information Technology, Inc. (prime) Triune Software, Inc. (sub)

Resources:	<u>FY</u>	<u>Dollars</u>	<u>Staff—Years</u>
	2003	\$72,000	.2
	2004	TBD	
Schedule:	<u>Start</u>	<u>End</u>	
	Sep 2000	Jun 2001—Build I	
	May 2002	Jan 2003—Build II (Spiral 1)	
Databases:	No databases were created as part of this project.		
Keywords:	Industry, Government, Estimating, Analysis, Policy, Reviewing/Monitoring, Weapon Systems		

Air Force Space and Missile Systems Center (SMC)

No input submitted.

Electronics Systems Center, Air Force Material Command (ESC/FMC)

No input submitted.

**UK Ministry of Defence, Pricing and Forecasting Group/Cost Forecasting
(PFG/CR)**

No input submitted.

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 Hobson Way (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: Analysis of Airborne and Ground Based Electronics Systems Cost Growth and Acquisition Reform Cost Initiatives

Summary: The purpose of this research is to identify cost growth in tactical and strategic missile systems and determine if acquisition reform efforts since 1990 have had any impact on the reduction of such cost growth. This research will be accomplished by incorporating cost data for tactical and strategic missile systems from annual Selected Acquisition Reports (SAR) into a single database. The cost data will be normalized to account for any deviations and analyzed in base-year dollars to eliminate inflation changes. Final program cost data will be compared to baseline estimates for cost growth determination. If cost growth is identified, then the results will be analyzed for correlation to acquisition reform efforts to determine if changing legislation helped reduce cost growth. In short, the objectives for this research are (1) to quantify the magnitude of cost growth in tactical and strategic missile systems, and (2) identify the impact of acquisition reform efforts on cost growth.

Classification: Unclassified

Sponsor: OSD(AT&L)

Performer: AFIT/ENV (1Lt Allen Phillips)

Resources: N/A

Schedule: Start End
March 2003 March 2004

Database: Selected Acquisition Reports (SAR)

Publications: Pending

Keywords: Government, Analysis, Weapon Systems, Life Cycle, CPR/CCDR, Data Collection, Review

AFIT/ENV-2

Title: Assessing Cost Risk Using Historical Cost Variance Data

Summary: This research effort will analyze historical cost variance data from the SAR database to find patterns that might prove useful in estimating cost risk on new and on-going weapon systems acquisition programs. Certain types of cost variance will be ignored, such as inflation-caused cost variances and quantity-caused cost variances. Research will begin with an exhaustive review of current and past literature in the area of cost growth and cost risk. The researchers will create a working research database of applicable programs from the SAR database. This will enable the development of program cost variance profiles for the entire acquisition life of each program. Research will then employ logistic and multiple regression techniques to analyze which curve(s) best fits the different types of cost profiles for each of the different types of cost variances.

Classification: Unclassified

Sponsor: ASC/FMCE

Performer: AFIT/ENV (Capt Brandon Lucas and 1Lt Dan Genest)

Resources: N/A

Schedule: Start End
March 2003 March 2004

Database: Selected Acquisition Reports (SAR)

Publications: Pending

Keywords: Government, Analysis, Weapon Systems, SD&D, Production, Engineering, Statistics/Regression, Mathematical Modeling

AFIT/ENV-3

Title: A Model for Reducing Petroleum Consumption (RPC) on Air Force Installations

Summary: The purpose of this research is to develop a tool for Air Force installations that analyzes cost and performance tradeoffs associated with RPC. The research will provide a summary of the regulatory and policy drivers mandating RPC; compare and contrast various requirements of these policies; and develop a model that determines the right strategy for an Air Force installation to comply with this Executive Order, achieving 100% of mission requirements, and reducing the operating costs of an Air Force installation vehicle fleet. The research will be accomplished by first obtaining documentation on the various policy drivers associated with RPC and documentation describing the following options for developing a strategy to meet the petroleum reduction levels established in the Executive Order. Measures include: the use of alternative fuels in light, medium, and heavy-duty vehicles; the acquisition of vehicles with higher fuel economy, including hybrid vehicles; the substitution of cars for light trucks; an increase in vehicle load factors; a decrease in vehicle miles traveled; and a decrease in fleet size. Wright-Patterson AFB (WPAFB) will be used as the test case Air Force installation. A detailed analysis of the vehicle fleet at WPAFB will be performed to determine the requirements of the RPC implementation model. From this analysis, an RPC model will be developed that accounts for cost and performance tradeoffs associated with each strategy of RPC.

Classification: Unclassified

Sponsor: 88 ABW/LG

Performer: AFIT/ENV (1Lt Matt Laubacher)

Resources: N/A

Schedule: Start End
March 2003 March 2004

Database: N/A

Publications: Pending

Keywords: Government, Analysis, Land Vehicles, Life Cycle, Sustainability, Economic Analysis, Expert System

AFIT/ENV-4

Title: A Model for Implementing the Usage of Alternative Fueled Vehicles on Air Force Installations

Summary: The purpose of this research is to develop a tool for Air Force installations that analyzes cost and performance tradeoffs associated with alternative fuel vehicles (AFV) usage. The research will provide a summary of the regulatory and policy drivers mandating purchase and use of AFVs; compare and contrast various requirements of these policies; summarize the advantages and disadvantages of various alternative fuels; and develop a model that determines the right “mix” of AFVs for an Air Force installation that complies with Federal mandates, achieves 100% of mission requirements, and reduces the operating costs of an Air Force installation vehicle fleet. The research will be accomplished by first obtaining documentation on the various policy drivers associated with AFV usage and documentation describing the following alternative fuels: methanol, ethanol, natural gas (compressed and liquefied), liquefied petroleum gas, electricity, and hydrogen. Wright-Patterson AFB (WPAFB) will be used as the test case Air Force installation. A detailed analysis of the vehicle fleet at WPAFB will be performed to determine the requirements of the AFV implementation model. From this analysis, an AFV model will be developed that accounts for cost and performance tradeoffs associated with each type of AFV.

Classification: Unclassified

Sponsor: 88 ABW/LG

Performer: AFIT/ENV (Capt Kyle Martin)

Resources: N/A

Schedule: Start End
March 2003 March 2004

Database: N/A

Publications: Pending

Keywords: Government, Analysis, Land Vehicles, Life Cycle, Sustainability, Economic Analysis, Expert System

AFIT/ENV-5

Title: Analysis of Tactical and Strategic Missile Systems Cost Growth and Acquisition Reform Cost Initiatives

Summary: The purpose of this research is to identify cost growth in tactical and strategic missile systems and determine if acquisition reform efforts since 1990 have had any impact on the reduction of such cost growth. This research will be accomplished by incorporating cost data for tactical and strategic missile systems from annual Selected Acquisition Reports (SAR) into a single database. The cost data will be normalized to account for any deviations and analyzed in base-year dollars to eliminate inflation changes. Final program cost data will be compared to baseline estimates for cost growth determination. If cost

growth is identified, then the results will be analyzed for correlation to acquisition reform efforts to determine if changing legislation helped reduce cost growth. In short, the objectives for this research are, 1) to quantify the magnitude of cost growth in tactical and strategic missile systems and, 2) identify the impact of acquisition reform efforts on cost growth.

Classification: Unclassified
Sponsor: OSD(AT&L)
Performer: AFIT/ENV (Capt Chris Abate)
Resources: N/A
Schedule: Start End
 March 2003 March 2004
Database: Selected Acquisition Reports (SAR)
Publications: Pending
Keywords: Government, Analysis, Weapon Systems, Life Cycle, CPR/CCDR, Data Collection, Review

Defense Systems Management College (DSMC)

No input submitted.

The Aerospace Corporation (AEROSPACE)

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:	4	
	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%	

AEROSPACE-1

Title:	Small Satellite Cost Model (SSCM)		
Summary:	Funding provides continued maintenance of the Small Satellite Database with current missions and development of the Small Satellite Cost Model. This includes CER development, research into new methodologies, and implementation of the CERs into the computer model.		
Classification:	Unclassified		
Sponsor:	The Aerospace Corporation, Engineering Methods		
Performer:	Space Architecture Department and Cost and Requirements Department		
Resources:	<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
	00		
	01		
	02	3.0 MTS-months	
	03	2.5 MTS-months	
Schedule:	<u>Start</u>	<u>End</u>	
	Ongoing		
Database:	None		
Publications:	E. M. Mahr and G. G. Richardson, "Development of the Small Satellite Cost Model (SSCM) Edition 2002, 2003 <i>IEEE Aerospace Conference</i> , Big Sky, MT, March 8-15, 2003.		
Keywords:	Estimating, Space System, C&TD, Data Collection, Mathematical Modeling, Computer Model, CER		

AEROSPACE-2

Title: Software Cost & Productivity Model Enhancement

Summary: The Aerospace Corporation is updating its 1996 model of software development cost and productivity. The underlying database will contain information for space and related ground system software development activities completed since January 1, 1996. Data records will include information on software function, programming language, the projected and actual size of the software developed, labor effort, development schedule, operating environment, function, and COTS integration. The model will be a series of cost and scheduling estimating relationships based on cross-sections of the data.

Classification: Unclassified

Sponsor: The Aerospace Corporation
2350 E. El Segundo Blvd.
El Segundo, CA 90245
Dr. Jonathan Gayek, (703) 633-5148

Performer: The Aerospace Corporation

Resources: FY Dollars Staff-years
03 \$100,000

Schedule: Start End
1 Oct 2002 30 Sept 2003

Database: None

Publications: TBD

Keywords: Industry, Estimating, Space Systems, Software, Statistics/Regression, CER

AEROSPACE-3

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, cost overruns.

Classification: Contractor-Proprietary; Government/FFRDC Eyes Only

Sponsor: The Aerospace Corporation (Internal Research (IR&D) Program)
Mail Station: M4-021
P. O. Box 92957
Los Angeles, CA 90009-2957
Mr. Laurent Sidor, (310) 336-1571

Performer: The Aerospace Corporation

Resources: FY Dollars Staff-years
03 3.0 MTS-months

Schedule: Start End
Ongoing

Database: *Title:*
Description:
Automation:

Publications: TBD

Keywords: Government, Programming, Forces, Life Cycle, Acquisition Strategy, Mathematical Modeling, Computer Model, Budgeting, Schedule, Space Systems, C&TD

MITRE Corporation (MITRE)

No input submitted.

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:	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:	11
	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:	Software Cost Estimation and Sizing Methods, Issues, and Guidelines
Summary:	This project has two objectives: to assess the current industry and government methods used to estimate software size as input to software cost estimates, and to provide a set of guidelines for using cost estimation methods. However, the overriding goal is to help AFCAA manage the risks inherent in providing software cost estimates early in a project's life. The result will be two reports. The first will contain three parts: a discussion of current sizing techniques, their pros and cons, and the issues that must be addressed if additional or improved sizing methods are to be adopted by the AFCAA. The second report will contain a checklist that can be applied to an existing or proposed cost estimation method to help assess its appropriateness or usefulness in a given situation.
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 one staff year for FY 2003

Schedule: Start End
 Oct 2002 Sep 2003 (draft report)

Database: None

Publications: In work

Keywords: Industry, Government, Estimating, Software, Survey, Review

RAND-2

Title: The Impact of Price Based Acquisition on DoD Programs

Summary: The purposes of this project are to:

- 1) Document savings/cost avoidance on government and contractor activities due to use of price-based acquisition strategies in a manner useful to the acquisition, planning, and cost estimating communities;
- 2) Generate recommendations for approaches to more accurately assessing the potential cost savings and cost avoidance that can be expected from the wider use of PBA. The focus will be on specific recommendations useful to the acquisition management, programming, and cost estimating communities;
- 3) Develop recommendations regarding the more effective implementation of PBA, as well as measures aimed at reducing any potential new risks that arise from the use of PBA.

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 1.2 staff years

Schedule: Start End
 Oct 2002 Sept 2003 (Draft Report)

Database: None

Publications: In work

Keywords: Government, Policy, Weapon Systems, Acquisition Strategy, Review

RAND-3

Title: F/A-22 and F/A-18 E/F Engineering/Manufacturing Development Case Studies: Lessons Learned

Summary: This project will involve an analysis of the approaches used by Boeing and Lockheed, the objectives and the priorities of the USN and USAF, compare data such as weight growth, cost growth, development strengths and difficulties, and other factors to provide lessons learned from each aircraft useful for future cost estimators, program managers, etc. who will be involved in the next generation of aircraft. An in-depth case study of each aircraft's development would be made using all available program, cost, schedule, and technical data, including interviews with government and contractor participants in both the F/A-18E/F and F/A-22 programs. From these data, a side-by-side comparison will be made on a variety of issues, including approaches and philosophies by the USAF and USN in managing EMD; contractor differences in managing EMD activities; growth patterns for cost, schedule, and aircraft weight; performance trade-offs; and any other metrics which provide insight into similarities and differences between the aircraft.

Although some classified material may be reviewed as part of the project, the final report will not be classified.

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 one staff year

Schedule: Start End
Oct 2002 Sept 2003 (Draft Report)

Database: None

Publications: In work

Keywords: Government, Analysis, Aircraft, C&TD, Case Study, Study

RAND-4

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 first phase, the effects of aircraft aging on aircraft depot level reparables and consumable supplies will be analyzed and their effect on flying hour (FH) cost factors will be developed. In the second phase, the cost of aircraft aging will be analyzed for its impact on funding for DLRs and consumable supplies across the FYDP. In Phase 3, aircraft overhaul, engine overhaul, and base maintenance CERs will be developed. In Phase 4, aircraft modification CERs will be developed using the Investment Budget Documentation System (IDOCs) database maintained by SAF/AQ and other sources. Finally, in a final 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 one staff year annually

Schedule: Start End
Nov 2000 Apr 2002—Phase 1
Apr 2002 Oct 2002—Phase 2
Nov 2002 May 2003—Phase 3
Nov 2002 Sep 2003—Phase 4

Database: None

Publications: In work

Keywords: Government, Estimating, Aircraft, Operations and Support, CER

RAND-5

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 latest SARs submitted as part of the annual President's Budget. 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.

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 one-half staff year

Schedule: Start End
Mar 2001 Continuing

Database: None

Publications: In work

Keywords: Government, Analysis, Weapon Systems, Study

RAND-6

Title: Analysis of Systems Engineering and Program Management Costs

Summary: The objective of this study is to analyze the effects of new concepts and practices, such as manufacturing processes, out sourcing, integrated product teams, and acquisition reform principles, on systems engineering/program management (SE/PM) costs. Past cost methodologies often used factors of weapon system costs to estimate SE/PM costs. In today's development and manufacturing environment, these methods may not produce accurate results. This analysis will attempt to look at other methodologies available to cost estimators for SE/PM costs.

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 one-half staff year

Schedule: Start End
May 2002 Sept 2003

Database: None

Publications: In work

Keywords: Government, Analysis, Weapon Systems, Production, Study

RAND-7

Title: Developing a Space Systems Sufficiency Review Handbook

Summary: The objective of this study is to expand and update the Air Force Cost Analysis Agency (AFCAA) resources and guidelines for performing sufficiency reviews of Analyses of Alternatives (AoAs), program office estimates (POEs), and any other items requiring a

sufficiency review by creating a Space Systems Sufficiency Review Handbook. The Handbook will include sections for spacecraft buses, various types of payloads, ground segment, integration activities, systems engineering/program management, and launch costs. The project will not address space operating and support costs. RAND will initially collect and normalize cost, technical, programmatic data, and previous cost estimates for various space systems to produce crosschecks, “rules of thumb,” and other metrics useful for evaluating cost estimates. Eventually, each Handbook section will include relevant past and current cost research studies (including past and current RAND research), methodologies, average factors and learning curves with ranges, “rules of thumb” (such as dollars per pound, dollars per drawing, hours per pound, hours per drawing, etc.), and recommended approaches to estimating each space WBS element. Some of these recommended methods may be the result of limited, original cost research by RAND using contractor and other sources of original data. The emphasis will be on helping analysts identify cost drivers and potential issues early, providing enough background to focus their analysis and data gathering in the areas most useful to their review.

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 one staff year

Schedule: Start End
Jan 2003 Sept 2003

Database: None

Publications: In work

Keywords: Government, Space Systems, Review

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:	2	
	Consultants:	8	
	Subcontractors:	0	
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:	2	
	Average number of staff-years expended per project:	1.25	
	Percentage of effort conducted by consultants:	10%	
	Percentage of effort conducted by subcontractors:	0%	

CNAC-1

Title:	Program Manager Education		
Summary:	There have been increasing demands on the DoN's program-management personnel, as well as an increasingly complex management environment for acquisition programs. Thus, it is essential that the personnel who manage and staff DoN's acquisition program offices and related management headquarters have appropriate qualifications and training. We will survey current requirements and opportunities under the Defense Acquisition Workforce Improvement Act (DAWIA) and the Defense Acquisition University (DAU). We will compare and contrast these requirements and educational opportunities with those in the private sector. We will note areas where improvements might be made.		
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:	<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
	2002	\$145,000	0.4
	2003	\$75,000	0.2
Schedule:	<u>Start</u>	<u>End</u>	
	Oct 2001	Jun 2003	
Database:	TBD		
Publications:	TBD		
Keywords:	Government, Reviewing/Monitoring, Weapon Systems, Training, Study		

CNAC-2

Title: Financial Health of Defense Contractors

Summary: The Assistant Secretary of the Navy (Research, Development, and Acquisition) must monitor the financial health of the defense industrial base to ensure that the Department of the Navy acquires systems at the best value for the taxpayers, and that there are no gaps in critical technologies. Several financial metrics are already being collected by the Office of the Deputy Under Secretary of Defense (Industrial Affairs). We will determine which metrics they are collecting, their data sources and their frequency of reporting. We will then assess whether OSD's financial metrics also meet the information requirements of the ASN(RDA). Our investigation will consider the set of companies over which metrics are computed, the number and choice of metrics, and the frequency of reporting.

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:

<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
2003	\$75,000	.2

Schedule:

<u>Start</u>	<u>End</u>
Jan 2003	Aug 2003

Database: TBD

Publications: TBD

Keywords: Industry, Acquisition Strategy, Database, Study

CNAC-3

Title: Military Hospital Cost Analysis—Phase II

Summary: This project is developing tools to program the subset of the Defense Health Program (DHP) corresponding to in-house care provided in CONUS military hospitals and clinics. The tools will determine "should-cost" budgets for individual hospitals, based on a combination of internal (data envelopment analysis) and external benchmark efficiency scores. The individual hospital budgets can then be aggregated to determine funding levels for the appropriate set of program elements over the FYDP.

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:

<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
2002	\$225,000	1.0
2003	\$225,000	1.0

Schedule:

<u>Start</u>	<u>End</u>
Feb 2002	Jan 2004

Database:

Title:	Efficiency Scores for Military Hospitals
Description:	Internal (data envelopment analysis) and external benchmark efficiency scores for every military hospital in CONUS
Automation:	Microsoft Access

Publications: TBD

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

CNAC-4

Title: Implementing Acquisition Metrics

Summary: The Assistant Secretary of the Navy (Research, Development, and Acquisition) previously asked CNA to examine the Department of the Navy's current metrics for monitoring acquisition programs and to suggest improvements where necessary. Completion of that effort resulted in a proposal to implement a Balanced Scorecard Strategic Management System. In this study we are building on the earlier recommendations to assist in implementation of improved 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:

<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
2003	\$240,000	1.1

Schedule:

<u>Start</u>	<u>End</u>
Feb 2002	Jan 2004

Database: TBD

Publications: TBD

Keywords: Government, Reviewing/Monitoring, Weapon Systems, SD&D, Production, Study

CNAC-5

Title: Inventory and Assessment of Models for Navy PPBS

Summary: Numerous analytical models and similar tools are used in many offices and commands to determine resource requirements during DON's PPBS process. However, there is no universal mechanism for assessing the reliability and utility of these models. OpNav's Assessment Division (N81) has asked us to identify and assist in the validation of models used in PPBS, and to consider how the models should be managed on an on-going basis. We will develop recommendations for an on-going protocol to ensure continuing methodological soundness, reliability, and utility of analytical models used by DON during the PPBS process.

Classification: Unclassified

Sponsor: Office of the Chief of Naval Operations, Assessment Division (N81)

Performer: CNA Corporation, Cost and Acquisition Team
Dr. Peter Francis, (703) 824-2094

Resources:

<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
2003	\$240,000	1.0
2004	\$70,000	0.2

Schedule:

<u>Start</u>	<u>End</u>
Jan 2003	Jan 2004

Database: N/A

Publications: TBD

Keywords: Government, Mathematical Modeling, Programming, Budgeting, Study

CNAC-6

Title: Commercial and Navy Acquisition Practices

Summary: The Assistant Secretary of the Navy (Research, Development and Acquisition) has asked CNA to review developments in commercial and Navy acquisition practices, and evaluate the suitability of adopting or adapting innovative commercial practices for the Department of the Navy. At the sponsor's direction, we are focusing on the use of procurement auctions, particularly the savings from open-bid versus sealed-bid auctions.

Classification: Unclassified

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

Performer: CNA Corporation, Cost and Acquisition Team
Dr. W. Brent Boning, (703) 824-2240

Resources:	<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
	02	\$180,000	0.75
	03	\$30,000	0.1

Schedule:	<u>Start</u>	<u>End</u>
	Jan 02	Jul 03

Database: N/A

Publications: TBD

Keywords: Government, Reviewing/Monitoring, Material, Study

Institute for Defense Analyses (IDA)

Name:	Institute for Defense Analyses	
Address:	4850 Mark Center Drive, Alexandria, VA 22311-1882	
Director:	Dr. Stephen J. Balut, (703) 845-2527, E-mail: sbalut@ida.org	
Size:	Professional:	54
	Support:	5
	Consultants:	40
	Subcontractors:	2
Focus:	Cost of Weapon Systems, Forces, and Operations	
Activity:	Number of projects in process:	58
	Average duration of a project:	1 year
	Average number of staff members assigned to a project:	2–4
	Average number of <i>staff</i> -years expended per project:	1
	Percentage of effort conducted by consultants:	30%
	Percentage of effort conducted by subcontractors:	2%

IDA-1

Title:	Assessment of Contractor Cost Data Reporting (CCDR) and Software Resource Data Report (SRDR) Systems
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 the DoD Services to determine relevant cost components, 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 seven years, the Defense Cost and Resource Center (DCARC) 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. While much has been done, several important areas continually need to be addressed such as exploring alternative reporting approaches, assessing internal process activities, developing performance metrics, and evaluating contractor cost accounting practices. Recently DCARC and other CAIG representatives have developed and implemented the SRDR system to collect business metrics on software projects costing over \$25 million within ACAT I programs. This system will be integrated with the CCDR system to obtain the benefits of an established infrastructure that provides for electronic Internet-based data collection, storage, and remote access to authorized users. Much emphasis will now be directed towards finalizing needed policies, business rules and procedures, and ensuring responsible government and contracting entities plan and execute their responsibilities accordingly.
Classification:	Unclassified
Sponsor:	OSD(PA&E) WSCAD/CCDR-PO Suite 500, CGN Arlington, VA Mr. Ron Lile, (703) 602-3169

Performer: IDA
4850 Mark Center Drive
Alexandria, VA 22311-1882
Mr. John Bailey (703) 845-2534, jbailey@ida.org
Mr. Jack Cloos, (703) 845-2506, jcloos@ida.org

Resources: FY Dollars Staff-years
2001 \$350,000
2002 \$286,000
2003 \$0

Schedule: Start End
Oct 1996 Ongoing

Database: Not applicable

Publications: None

Keywords: Government, Industry, Estimating, Analysis, Labor, Material, Software, Schedule, Study, Overhead/Indirect, Economic Analysis

IDA-2

Title: O&M Program Balance & Related Cost Drivers

Summary: The \$100B+ budget for the Operations and Maintenance (O&M) appropriation operates and maintains the combat forces and their supporting infrastructure. Despite its size, there are currently no fully adequate tools to assess the adequacy of O&M budget levels. This task aims at developing suitable benchmarks for O&M program evaluation. Its focus is the size and content of the total O&M budget. This contrasts with the more narrowly defined area of weapons system O&M costing. The initial round of research created a historical O&M budget database, identified cost drivers and developed cost-estimating relationships. These were used experimentally in the FY04 Program/Budget Review. Continued research aims to improve the explanatory powers of each benchmark by adding additional factors where necessary, enable adjustments to the benchmarks for the continued war on terrorism and the war in Iraq, and control for changes in equipment mix and age. (CARD/BA-7-1856)

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
4850 Mark Center Drive
Alexandria, VA 22311-1882
Daniel L. Cuda, (703) 578-2770

Resources: FY Dollars Staff-years
2000 \$230,000 1.5
2001 \$200,000 1.2
2002 \$350,000 2.2
2003 \$250,000 1.6

Schedule: Start End
Sept 1999 Dec 2003

Database: Historical O&M by Service Component and O&M SAG, 1981-2001

Publications: Background Briefings

Keywords: Government, Analysis, Policy, Programming, Data Collection, Data Base, Study, Operations & Maintenance, Readiness, Metrics

IDA-3

Title: Ballistic Missile Technical Collection Analysis of Alternatives

Summary: Provided cost analysis estimates in support of the Ballistic Missile Technical Collection Analysis of Alternatives (AOA) and expanded to address additional DIA and CIA selected alternatives. The AOA was being conducted to support a decision that would impact the FY2003 POM. The objective of work was to support the AOA Cost Panel by providing cost estimates of alternative collection systems proposed by members of the BMTC Technical and Cost Panels. The primary systems being considered for replacement in the AOA were Cobra Judy and Cobra Ball. Cobra Judy is a civilian-staffed ship equipped with both X-band dish and phased array S-band radars and used to gather technical information on ballistic missiles. Cobra Ball - RC-135S is an airborne technical collection aircraft that uses infrared telescopes for tracking ballistic-missile tests at long range. Twenty-three alternatives were estimated that were developed from six different platform and sensor combinations. Each estimate included total life cycle costs and a risk assessment. In developing the risk assessment three cost methods were used for the Cobra Judy II replacements. One methodology used a proprietary model directed by the OSD(CAIG) panel chairman. The other methods included one based on cost estimates provided by a contractor and the other was based on IDA's independent assessment of costs. The study effort was expanded to investigate the cost of four Cobra Judy replacement options.

Classification: Unclassified with proprietary data

Sponsor: Office of the Director, Program Analysis and Evaluation (PA&E)

Performer: Institute for Defense Analysis (with subcontractor support from Technomics, Inc.)
4850 Mark Center Drive
Alexandria, VA 22311-1882
Mr. Waynard Devers, (703) 845-2252, wdevers@ida.org

Resources:

<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
2001	\$435,000	3.0

Schedule:

<u>Start</u>	<u>End</u>
Feb 2001	Mar 2003

Database: None

Publications: Analysis of Alternatives (AOA) for Ballistic Technical Collection (BMTC): Review of Cost Estimates, IDA Paper P-3632, Draft Final, August 2001 and Analysis of Alternatives (AoA) for Ballistic Missile Technical Collection (BMTC): Review of Cost Estimates, 2003, IDA Paper P-3754, Draft Final, March 2003

Keywords: Government, Analysis, Missiles, Life Cycle, Study

IDA-4

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(AT&L)/ARA/AR
The Pentagon, Rm. 3D765
Washington, DC 20301
Mr. Steve Dratter, (703) 697-8020

Performer: IDA
4850 Mark Center Drive
Alexandria, VA 22311-1882
Mr. David A. Drake, (703) 845-2573

Resources:

<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
1999	\$75,000	0.6
2000	\$50,000	0.4
2001	\$75,000	0.6
2003	\$50,000	0.3

Schedule:

<u>Start</u>	<u>End</u>
Jan 1999	Indefinite

Database:

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-5

Title: FYDP Viewers Upgrade

Summary: Much of the data used by the Under Secretary of Defense for Acquisition, Technology, and Logistics (OUSD (AT&L)) to manage the investment appropriations comes from the Future Years Defense Program (FYDP) and the RDT&E and Procurement Program Annexes. A software tool called the FYDP Viewers, used to query the FYDP and Program Annexes for data for many analyses, has become outdated and difficult to maintain. The objective of this task is to rewrite the FYDP Viewers using more modern tools, redesign the underlying databases to provide a structured query generation environment for AT&L analysts, and make the system easier to maintain. The new system should have all of the functionality of the current FYDP Viewers, be expanded to include the ability to query the FYDP using new attributes such as Force and Infrastructure Codes, and operate in the Citrix Server environment. This task will also investigate ways to implement the new FYDP Force and Infrastructure Codes in the DoD Selective Program Element Analysis Report (DoDSPEAR) model vice the Infrastructure Codes currently used

Classification: Secret

Sponsor: OUSD(AT&L)/ARA/AR
The Pentagon, Rm. 3D161
Washington, DC 20301
Mr. Milt Nappier, (703) 697-6070

Performer: IDA
4850 Mark Center Drive
Alexandria, VA 22311-1882
Mr. David A. Drake, (703) 845-2573

Resources:

<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
2002	\$125,000	0.75

Schedule: Start End
 Jun 2002 Indefinite

Database: Title: MDAPs
 Description: FYDP type data for all DoD programs and RDT&E and Procurement Annexes to include Defense Mission Categories, Program Element, Procurement Annex Line Item, Infrastructure Codes, and Force & Infrastructure Codes.
 Automation: Microsoft .Net, Visual Basic 6.0, Access, FoxPro, dBASE

Publications: TBD

Keywords: Government, Programming, Forces, Acquisition Strategy, Operations and Support, Mathematical Modeling, Statistics/Regression, Computer Model

IDA-6

Title: Economic Drivers of Defense Overhead Costs

Summary: The objective of this task is to identify the economic factors that drive the overhead costs charged by defense firms. Current financial data will be collected from five contractors to update existing databases. A theoretical model of overhead costs from an economic framework will be developed. The second portion of the task is the development of an automated database to facilitate cost estimating and other cost analysis tasks.

Classification: Unclassified/Proprietary Information

Sponsor: OD(PA&E)
 The Pentagon, Rm. BE799
 Washington, DC 20301
 Mr. Ed Kelly (703) 697-6712

Performer: IDA
 4850 Mark Center Drive
 Alexandria, VA 22311-1882
 Dr. Thomas Frazier, (703) 845-2132, tfrazier@ida.org

Resources: FY Dollars Staff-years
 2000 \$175,000
 2002 \$100,000
 2003 \$100,000

Schedule: Start End
 Apr 1995 Ongoing

Database: Title: IDA's Defense Contractor Overhead Database, Contractor Cost Data Reports
 Description: Collecting and analyzing contractor data to support overhead cost estimating
 Automation: Incorporating data into an automated database.

Publications: None

Keywords: Industry, Government, Estimating, Database, Overhead/Indirect, Economic Analysis, Study

IDA-7

Title: DOD Semiconductor Foundry

Summary: The objective of this task is respond to a congressional mandate that the Department of Defense conduct a study to examine the long-term DoD acquisition model for advanced semiconductor devices used in military and intelligence applications. Specifically, the language in the conference report directed that focus of study should address "...whether a consolidated U.S. semiconductor foundry could offer the U.S. Government a solution to the impending advanced technology procurement challenge."

Classification: Unclassified/Proprietary Information
Sponsor: USD(AT&L)/IP/
Washington, DC 20301
LTC. Chris Warack, (703) 601-5008
Performer: IDA
4850 Mark Center Drive
Alexandria, VA 22311-1882
Dr. Thomas P. Frazier, (703) 845-2132
Resources: FY Dollars Staff-years
Prior \$185,000 2
Schedule: Start End
Mar 2003 Sep 2003
Database: None
Publications: Draft Paper in work
Keywords: Government, Estimating, Analysis, Electronics/Avionics, Production, Data Collection, Study

IDA-8

Title: JASSM
Summary: The JASSM milestone c decision will take place in November, 2003. In preparation for this decision meeting, cost for the basic and extended range variant of the missile will be examined. This task is complicated by the price-based acquisition strategy that will require cost analysts to investigate market forces that drive prices. IDA will assist with development of alternatives and in providing visibility to cost drivers and relevant market forces related to this acquisition.
Classification: Unclassified
Sponsor: OSD(PA&E)
Performer: IDA
4850 Mark Center Drive
Alexandria, VA 22311-1882
Dr. Thomas P. Frazier, (703) 845-2132
Resources: FY Dollars Staff-years
2003 \$200,00 2
Schedule: Start End
Apr 2003 Oct 2003
Database: None
Publications: TBD
Keywords: Government, Estimating, Missiles, Production, Acquisition Strategy, Economic Analysis, Study

IDA-9

Title: DSCA Business Metrics
Summary: The objective of this task is to 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
4850 Mark Center Drive
Alexandria, VA 22311-1882
Dr. Thomas P. Frazier, (703) 845-2132
Resources: FY Dollars Staff-years
1997 \$300,00 2
Schedule: Start End
Jul 1999 Oct 2003
Database: None
Publications: TBD
Keywords: Government, Estimating, Automation, Software, Study

IDA-10

Title: Contingency Operations Support Tool (COST)
Summary: The objective of this task is to continue to refine procedures for estimating the cost of proposed and on-going military operations, and to further develop the automated tool for conducting such estimates. The OSD(C), Joint Staff, and the Military Departments will utilize these procedures and automated tool to estimate the cost of military operations associated with America's War on Terrorism. IDA will operate COST on a continuous basis, available world-wide to multiple, concurrent, multi-platform users as a web-based tool with a single web-based operations database on a secure SIPRNet server located at IDA.
Classification: Unclassified
Sponsor: Office of the Under Secretary of Defense (Comptroller), Program/Budget
Mr. Roberto Rodriguez
Performer: IDA
4850 Mark Center Drive
Alexandria, VA 22311-1882
Michael Frieders, (703) 845-2140
Resources: FY Dollars Staff-years
2000 \$425,000
2001 \$600,000
2002 \$1,200,000
Schedule: Start End
Mar 2003 Dec 2003
Data Base: Microsoft Access/SQL Server
Publications: COST Users Guide
COST Executables
Keywords: Estimating, Analysis, Budgeting, Computer Model

IDA-11

Title: Army Enlistment Early Warning System
Summary: This task updates an enlistment early warning system for the Army.
Classification: Unclassified
Sponsor: Greg Wise, OSD(PA&E), Economic Analysis and Research

Performer: IDA
4850 Mark Center Drive
Alexandria, VA 22311-1882
Dr. Lawrence Goldberg, (703) 578-2831

Resources: FY Dollars Staff-years
2002 80,000 0.4

Schedule: Start End
Aug 2002 Sep 2003

Database: None

Publications: None

Keywords: Government, Analysis, Manpower/Personnel, Mathematical Modeling, Method

IDA-12

Title: Methods to Assess Schedules for the Strategic Defense System

Summary: The objective of this task is to develop methods for assessing the acquisition schedules of ballistic missile defense systems. The systems include space-based surveillance and interceptor systems, surface-based interceptor systems, and other surface-based elements. Elements include software as well as hardware.

Classification: Unclassified

Sponsor: MDA/RME
2120 Washington Blvd., Suite 100
Arlington, VA 22204
Mr. William Seeman, (703) 604-3764

Performer: IDA
Mr. Bruce Harmon, (703) 845-2510, bharmon@ida.org

Resources: FY Dollars Staff-years
1999 and prior \$215,000 1.4

Schedule: Start End
Jan 1991 Jun 2002

Database: **Description:** Schedule and characteristic data on 26 unmanned spacecraft, 22 missile, and 51 software programs.
Automation: None

Publications: "Assessing Acquisition Schedules for Unmanned Spacecraft," IDA Paper P-2766, April 1993
"Schedule Assessment Methods for Surface-Launched Interceptors," IDA Paper P-3014, August 1995
"Schedule Assessment Methods for Ballistic Missile Defense Ground-based Software Development," IDA Paper P-3600, forthcoming

Keywords: Government, Schedule, Estimating, Method, Statistics/Regression, Space Systems, Missiles, SD&D, Production

IDA-13

Title: Costs of Developing and Producing Next Generation Tactical Aircraft

Summary: The objective of this task is to collect, analyze and exploit the latest available information to develop databases and methods for estimating the development and production costs of next generation fighter/attack aircraft. Costs covered include airframe, avionics, propulsion and software. A cost model is presented that includes CERs at the component level, cost progress function relationships and modeling of plant-wide costs.

Classification: Unclassified

Sponsor: OSD(PA&E)
The Pentagon, Room BE779
Washington, DC
Mr. Gary Pennett, (703) 695-7282

Performer: IDA
Mr. Bruce Harmon, (703) 845-2510, bharmon@ida.org

Resources: FY Dollars Staff-years
Prior to 2001 \$550,000 3.5
2001 \$200,00 1.5

Schedule: Start End
Jan 1998 Sept 1003

Database: *Description:* Cost and characteristic data from 20 aircraft programs.
Automation: None

Publications: TBD

Keywords: Government, Estimating, Method, Statistics/Regression, Aircraft, SD&D, Production

IDA-14

Title: Support Labor Cost For Military Aircraft

Summary: The objective of this task is to collect, analyze and exploit the latest available information to develop databases and methods for estimating the support labor costs of military aircraft. Support labor categories analyzed include recurring engineering, tooling and quality control. CERs are presented for each labor category.

Classification: Unclassified

Sponsor: OSD(PA&E)
The Pentagon, Room BE779
Washington, DC
Mr. Gary Pennett, (703)695-7282

Performer: IDA
Mr. Bruce Harmon, (703) 845-2510, bharmon@ida.org

Resources: FY Dollars Staff-years
2000 \$200,000 1.5

Schedule: Start End
Jan 2000 Sept 2002

Database: *Description:* Cost and data from 8 aircraft programs.
Automation: None

Publications: TBD

Keywords: Government, Estimating, Method, Statistics/Regression, Aircraft, SD&D, Production

IDA-15

Title: Developing a Life Cycle Cost Model and Conducting a Cost Analysis of the Advanced Multifunction RF-Concept (AMRF-C)

Summary: Develop a life cycle cost methodology for analyzing the affordability of AMRF concept, and undertake cost comparisons of AMRF-C to the legacy systems used in specific missions or scenarios.

Classification: Unclassified

Sponsor: OSD/CAIG and Office of Naval Research

Performer: IDA
4850 Mark Center Drive
Alexandria, VA 22311
Dr. John Hiller (703) 845-6783

Resources: FY Dollars Staff-years
2002 \$300,000

Schedule: Start End
Feb 2002 Feb 2003

Database: None

Publications: Annotated briefing of final results

Keywords: Estimating, Electronics/Avionics, Life Cycle

IDA-16

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 is the focus of FY01 and FY-02.

Sponsor: Deputy Director (General Purpose Programs) Program Analysis and Evaluation
The Pentagon, Rm. 2E274
Washington, DC 20301
Ms. Christine Lyons, (703) 697-9132

Performer: IDA
4850 Mark Center Drive
Alexandria, VA 22311-1882
Mr. Stanley A. Horowitz, (703) 845-2450

Resources: FY Dollars Staff-years

1997	\$340,000	2.2
1998	\$360,000	2.3
1999	\$175,000	1.1
2000	\$158,000	1.0
2001	\$100,000	0.7
2002	\$ 90,000	0.6
2002	\$ 50,000	0.3

Schedule: Start End
Oct 1996 Dec 2003

Database: Equipment inventories over time and potential capability measures. Age and plant replacement value of facilities by type and location. MILCON and RPM programmed investment

Publications: TBD

Keywords: Government, Analysis, Review, Policy, Programming, Forces, Life Cycle, Data Collection, Time Series, Database, Computer Model

IDA-17

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
4850 Mark Center Drive
Alexandria, VA 22311-1882
Mr. Stanley A. Horowitz, (703) 845-2450

Resources:	<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
	1996	\$175,000	1.0
	1997	\$250,000	1.4
	1998	\$300,000	1.6
	1999	\$300,000	1.6
	2000	\$ 50,000	0.3

Schedule:	<u>Start</u>	<u>End</u>
	Jan 1996	Dec 2001

Database: *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," Document D-2633, Institute for Defense Analyses, April 2000
"Command and Staff Training for National Guard Divisions and Separate Brigades," Document D-2424, Institute for Defense Analyses, September 2000

Keywords: Government, Analysis, Policy, Manpower/Personnel, Readiness, Data Collection, Database, Study

IDA-18

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 Terry Gerton, (703) 697-0221

Performer: IDA
4850 Mark Center Drive
Alexandria, VA 22311-1882
Mr. Stanley A. Horowitz, (703) 845-2450

Resources: FY Dollars Staff-years
1998 \$600,000 3.2
1999 \$300,000 1.6
2000 \$300,000 1.6

Schedule: Start End
Feb 1998 Dec 2003

Database: TBD

Publications: TBD

Keywords: Government, Analysis, Policy, Infrastructure, Facilities, Overhead/Indirect, Data Collection, Cost/Production Function, Study

IDA-19

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
4850 Mark Center Drive
Alexandria, VA 22311-1882
Mr. Stanley A. Horowitz, (703) 845-2450

Resources: FY Dollars Staff-years
2000 \$300,000 1.8

Schedule: Start End
Nov 1999 Dec 2001

Database: Website for Management Headquarters Issues developed for the Office of Departmental Administration and Management, OSD

Publications: "Report on Department of Defense Major Headquarters Activities," Document D-2630, Institute for Defense Analyses, June 8, 2001

Keywords: Government, Analysis, Policy, Data Collection, Database, Study

IDA-20

Title: Training Transformation Funding and Requirements Validation Study

Summary: This study examines whether the program for transforming joint training to better support Combatant Commander requirements is properly focused and funded.

Classification: Unclassified

Sponsor: Director for Operational Plans and Interoperability
The Pentagon, Rm. 1E1019
Washington, DC 20318
LtCol Lyndon S. Anderson, (703) 692-7255

Performer: IDA
4850 Mark Center Drive
Alexandria, VA 22311-1882
Mr. Stanley A. Horowitz, (703) 845-2450

Resources: FY Dollars Staff-years
2003 \$300,000 1.8

Schedule: Start End
Mar2003 Aug 2003

Database: TBD

Publications: TBD

Keywords: Government, Analysis, Policy, Training, Study

IDA-21

Title: Consolidation of Defense Agency Overhead Functions

Summary: Examine the potential for reducing costs by consolidating overhead functions among Defense Agencies. If possible, develop a quantitative estimate of the potential savings.

Classification: Unclassified

Sponsor: Director Acquisition Resources and Analysis
The Pentagon, Rm. 3D161
Washington, DC 20301
Milton Nappier, (703) 697-6070

Performer: IDA
4850 Mark Center Drive
Alexandria, VA 22311-1882
Mr. Stanley A. Horowitz, (703) 845-2450

Resources: FY Dollars Staff-years
2002 \$ 50,000 0.3
2003 \$100,000 0.6

Schedule: Start End
Mar 2002 Oct 2003

Database: TBD

Publications: TBD

Keywords: Government, Analysis, Policy, Infrastructure, Study

IDA-22

Title: Total Manpower Cost of Military Personnel

Summary: This study will develop a methodology for identifying and estimating the full cost of military personnel with emphasis on marginal indirect costs. Recognizing the significant role that career management policies have on the total costs for many skill categories, particular attention will be given to developing a methodology that reflects these influences in different specialties and career fields.

Classification: Unclassified

Sponsor: Director, Program Analysis and Evaluation
The Pentagon, Rm. BE798
Washington, DC 20301
MAJ Greg Wise, (703) 692-8046

Performer: IDA
4850 Mark Center Drive
Alexandria, VA 22311-1882
Mr. Stanley A. Horowitz, (703) 845-2450

Resources:	<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
	2002	\$200,000	1.2
Schedule:	<u>Start</u>	<u>End</u>	
	May 2002	Dec 2003	
Database:	TBD		
Publications:	TBD		
Keywords:	Government, Analysis, Policy, Manpower/Personnel, Overhead/Indirect, Study		

IDA-23

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 benefits over a seven-year horizon and the administrative staff levels required to process these claims. These forecasts will be used to track the pending claim totals over the forecast horizon. We will develop a computer model to show the forecasts in various levels of detail and allow the user to perform a variety of what-if analyses. The current schedule calls for the model to be delivered in April 04.

Classification: Unclassified

Sponsor: Veterans Benefits Administration
Ms. Judy Reyes-Maggio, (202) 273-7203

Performer: IDA
4850 Mark Center Drive
Alexandria, VA 22311-1882
Dr. David E. Hunter, (703) 845-2549, dhunter@ida.org

Resources:	<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
	1998	\$300,000	2.0
	1999	\$150,000	1.0
	2000	\$100,000	0.75
	2002	\$50,000	0.25
	2003	\$600,000	4.0

Schedule: Start End
Sep 1998 May 2004

Database: **Title:** VBA Workload Forecasting Model
Description: Demographic data on the actual veteran population; projections of the veteran population for seven future years; and factors for disability claim submission rates within demographic cells
Automation: Visual Basic interface with Microsoft Access database

Publications: "Forecasting Compensation Workload for the Veterans Benefits Administration (VBA): Final Report," IDA Paper P-3536, August 2000

Keywords: Government, Budgeting, Infrastructure, Data Collection, Mathematical Modeling, Database, Computer Model

IDA-24

Title: Future Low Acquisition Cost Tactical Missiles

Summary: Before deciding on what capabilities to acquire, the DoD needs information on both performance and costs of alternative ways of performing the mission of attacking targets in the future. These alternatives have different performance characteristics and costs. In particular, DoD holds a large stock of tactical air-launched PGMs (Precision Guided Munitions) that follow near-ballistic trajectories. These weapons must therefore be dropped close to their intended targets, which makes our aircraft vulnerable to enemy point defenses. The objective of this task is to look for low-cost means of increasing the standoff range of PGMs using solid rocket motors and deployable wings.

Classification: Unclassified
Sponsor: USD(AT&L)/S&TS
Performer: IDA
4850 Mark Center Drive
Alexandria, VA 22311-1882
Dr. Daniel B. Levine, (703) 845-2562

Resources: FY Dollars Staff-years
2002 \$75,000 0.3

Schedule: Start End
Jun 2002 May 2003

Database: *Title:* Cost of Solid Rocket Motors (proprietary)
Description: Unit cost and quantity of solid rocket motors
Automation:

Publications: *Increasing the Standoff Range of PGMs*, Daniel B. Levine et al, Annotated Briefing in preparation, Unclassified

Keywords: Government, Analysis, Missiles, Propulsion, Manufacturing, Cost/Production Function, Study

IDA-25

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 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. Until last year, annual evaluations compared TRICARE costs in the year of interest with an estimate of what those costs would have been had the traditional benefit been continued. Last year's evaluation took a different approach by examining trends in TRICARE utilization and costs over the past few years and comparing them with corresponding civilian-sector benchmarks. This year's evaluation continues this approach but adds one more year of data to the trends.

Classification: Unclassified
Sponsor: TRICARE Management Activity (HPA&E)
5111 Leesburg Pike
Suite 517
Falls Church, VA 22041
Lt. Col. Pradeep Gidwani, (703) 681-0368

Performer: IDA
4850 Mark Center Drive
Alexandria, VA 22311-1882
Dr. Philip M. Lurie, (703) 845-2118

Resources: FY Dollars Staff-years
2001 \$783,000 3.6
2002 \$771,000 3.4

Schedule: Start End
Oct 2002 Sep 2003

Database: None

Publications: None

Keywords: Government, Analysis, Policy, Infrastructure, Manpower/Personnel, Test and Evaluation, Variable Costs, Data Collection, Survey, Mathematical Modeling, Economic Analysis, Database, Study

IDA-26

Title: Resource Analysis for Operational Test and Evaluation (OT&E)

Summary: Conduct resource analysis to support Office of the Director, Operational Test and Evaluation, in its statutory responsibility to advise the Secretary of Defense on the adequacy of T&E resources that support the operational test and evaluation phase of acquisition programs. Conduct analyses to support DOT&E participation in the activities of the *Commission on the Future of the United States Aerospace Industry*; and in senior level OSD activities associated with the Planning, Programming and Budgeting System and development of resource related policy recommendations throughout the PPBS cycle.

Classification: Unclassified

Sponsor: Principal Deputy Director, Operational Test and Evaluation
The Pentagon, Room 3D1067
1700 Defense
Washington, DC 20301-1700
Mr. David Duma, (703) 697-4813

Performer: IDA
4850 Mark Center Drive
Alexandria, VA 22311-1882
Mr. Dennis O. Madl, (703) 578-2718

Resources:

<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
1998	\$200,000	1.2
1999	\$100,000	0.6
2000	\$400,000	2.5
2001	\$400,000	1.9
2002	\$400,000	2.0
2003	\$300,000	2.5

Schedule:

<u>Start</u>	<u>End</u>
Feb 1998	Ongoing

Database:

Title: OT&E Resources

Description: Programmed and Budgeted Funds, Manpower

Automation: Excel spreadsheets

Publications: None

Keywords: Government, Analysis, Review/Monitoring, Policy, Programming, Budgeting, Weapon Systems, Facilities, Infrastructure, Manpower/Personnel, Test and Evaluation, Case Study, Data Collection

IDA-27

Title: Resource Analysis for Test and Evaluation—MRTFB

Summary: Analysis of resources related to management issues for T&E activities to improve T&E planning and programming--focusing on existing and proposed operations and business practices and policies; and extending ongoing analysis of Major Range and Test Facility Base (MRTFB) resource trends. 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. Also, conduct analysis to support reporting in the Director of Operational Test and Evaluation (DOT&E) Annual Report to Congress.

Classification: Unclassified

Sponsor: Deputy Director, Systems and Test Resources
Director, Operational Test and Evaluation
The Pentagon, Rm. 3D1067
Washington, DC 20301
Mr. Mike Crisp, (703) 681-4024 ext 147

Performer: IDA
4850 Mark Center Drive
Alexandria, VA 22311-1882
Mr. Dennis O. Madl, (703) 578-2718

Resources:

<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
FY01	\$2,500,000	13.8
FY02	\$2,500,000	13.1
FY03	\$2,500,000	12.5

Schedule:

<u>Start</u>	<u>End</u>
Oct 00	Ongoing

Database:

Title: T&E Resources

Description: Operating Cost, Investment Projects, Real Property Recapitalization, Cost of Testing

Automation: Excel spreadsheets; Access databases; Knowledge-base information retrieval system

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
“A Case Study on the Partnership Between Arnold Engineering Development Center and Loral,” IDA Document D-2689, Unclassified, March 2002

Keywords: Government, Analysis, Review/Monitoring, Policy, Programming, Budgeting, Infrastructure, SD&D, Test and Evaluation, Operations and Support, Acquisition Strategy, Facilities, Infrastructure, Manpower/Personnel, Labor, Overhead/Indirect, Economic Analysis, Study, Database, Case Study, Data Collection

IDA-28

Title: Support to SBR independent Cost Assessment

Summary: The Under Secretary of Defense, Acquisition, Technology and Logistics (AT&L) is taking steps to strengthen the Department’s capability to estimate the costs of space systems by realigning management activities and shifting some responsibilities. One of these changes is to transfer responsibility for conducting independent cost estimates for systems under the authority of the DoD Space Milestone Decision Authority from the Air Force to the OSD Cost Analysis Improvement Group (CAIG). IDA has routinely provided the OSD CAIG with data, information and methods for estimating the costs of defense systems. This support is being expanded to include space systems. IDA will provide support to Independent Cost Assessment Teams (ICATs) established to perform independent cost estimates (ICEs) for next generation space systems.

Classification: Classified at various levels

Sponsor: OSD(PA&E)
The Pentagon, Room BE-829
Washington, DC 20301
Mr. Jon M. Sweet, (703) 692-8041

Performer: IDA
4850 Mark Center Drive
Alexandria, VA 22311-1882
Dr. J. R. Nelson, (703) 845-2571, email: rnelson@ida.org

Resources: FY Dollars Staff-years
2003 \$200,000 1.0

Schedule: Start End
Apr 2003 Indefinite

Database: TBD

Publications: TBD

Keywords: Government, Estimating, Space Systems, Life Cycle, Data Collection, Case Study, Mathematical Modeling

IDA-29

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. Walt Cooper (703) 697-4312

Performer: IDA
4850 Mark Center Drive
Alexandria, VA 22311-1882
Mr. Ronald E. Porten, (703) 845-2145

Resources: FY Dollars Staff-years
1992 \$ 40,000 0.3
1993 \$220,000 2.4
1995 \$130,000 1.0
1996 \$150,000 1.2
1999 \$250,000 1.5
2000 \$322,000 1.7
2002 \$80,000 0.3
2003 \$200,000 0.8

Schedule: Start End
Sep 1992 Oct 2003

Database: **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
IDA Paper P-3660, "DoD Force & Infrastructure Categories: A FYDP-Based Conceptual
Model of Department of Defense Programs and Resources," September 2002

Keywords: Government, Programming, Forces, Mathematical Modeling, Computer Model

IDA-30

Title: FYDP Improvement, Phase II

Summary: In August 1996, the Deputy Secretary of Defense directed that the responsibility for FYDP update, maintenance, and distribution to be transferred to PA&E. Later the FYDP Improvement Program was initiated to develop electronic submission of the POM and FYDP, pursue integration of data requirements, and to identify systematic improvements to the FYDP data and structure. The program also integrates and consolidates other data sets within the program and budget data submissions required by OSD. These resulting data are integrated into the Defense Programming Database, a single source of data that supports the programming and budgeting processes of the department.

Current tasks include:

- a. **Review the Quality of Programming Data.** Consult with OSD offices, the services, and defense agencies on instances where data submitted by the services and agencies contain significant errors and discrepancies, do not correctly represent true component positions, or present significant reporting difficulty resulting in substantial manual interventions.
- b. **Manpower and Personnel, and Forces Data Centers.** Continue data development by formulating new combinations of existing “native” data that serve to display useful programmatic information.
- c. **Program Element Review.** Using the earlier developed Force and Infrastructure categories as a starting point, develop a framework for future creation, management, display and analysis of program elements that factually represents basic programmatic information with minimal analytical bias toward any preconceived artificial representations.
- d. **Program and Budget Data Integration.** Review investment data used by the programming and budgeting communities and identify additional opportunities to integrate and streamline these data.

Classification: Unclassified work dealing with a classified database

Sponsor: OD(PA&E), Programming and Fiscal Economics Division
The Pentagon, Rm. 2C282
Washington, DC 20301
Mr. Dean Pfoltzer (703) 693-7827

Performer: IDA
4850 Mark Center Drive
Alexandria, VA 22311-1882
Mr. Ronald E. Porten, (703) 845-2145

Resources:	<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
	1999	\$400,000	2.1
	2000	\$179,000	.9
	2001	\$300,000	1.5
	2002	\$450,000	1.8
	2003	\$400,000	1.6

Schedule:	<u>Start</u>	<u>End</u>
	Aug 1999	Oct 2003

Database: **Title:** Defense Programming Database
Description: Gathers and Organizes Programming Data the DoD
Automation: FYDP, MDAP

Publications: TBD

Keywords: Government, Programming, Forces, Infrastructure, Manpower/Personnel, Life Cycle, Automation, Data Collection

IDA-31

Title: Assistance to OSD(PA&E) Independent Cost Estimate of the Pentagon Renovation

Summary: IDA provided assistance to OSD(PA&E) analysts in their independent cost estimate of the Pentagon Renovation and Recovery. The program is a major renovation (roughly \$2.5 billion) with unique requirements for force protection and secure information technology and communications infrastructure. The IDA effort had three major elements. IDA prepared a formal description of the renovation program—including information on program content, acquisition strategy, schedule, and areas of risk—that served as the basis and scope of the PA&E cost estimate. IDA also conducted research on commercial construction cost estimating methods, and provided training to the PA&E staff on these methods. Finally, IDA reviewed the final version of the PA&E cost estimate, and assisted in the writing of the final report.

Classification: Unclassified

Sponsor: OSD(PA&E/RA)
Walt Cooper

Performer: IDA
4850 Mark Center Drive
Alexandria, VA 22311-1882
Lance Roark (703) 845-2473

Resources:	<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
	2002	\$50,000	0.2

Schedule: Start End
Mar 2002 Oct 2002

Database: None

Publications: None

Keywords: Government, Estimating, Facilities, Data Collection, Review

IDA-32

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 optimizing a Master Production Schedule of 8 systems for 10 years. Beginning August 1999 the study progressed to development of a costing and optimization model for the Master Production Schedule of 80 ACAT1 systems for an 18-year planning horizon, which has since been expanded to approximately 100 systems. This model was developed in September 2000 and has been deployed to OUSD(AT&L). Since then, RDT&E costs have also been added to the model for ACAT1 systems. The model continues to be modified for performance improvements, updating of underlying data and econometrics, and adding of new ACAT1 systems.

Classification: Unclassified

Sponsor: OUSD(AT&L)
Dr. Nancy Spruill
Mr. Phil Rodgers (COTR)

Performer: IDA
4850 Mark Center Drive
Alexandria, VA 22311-1882
Dr. Charles Weber (703) 845-6784

Resources:	<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
	1998	\$90,000	0.5
	1999	\$450,000	2.4
	2000	\$1,200,000	5.6
	2001	\$450,000	2.4
	2002	\$200,000	1.1
	2003	\$200,000	1.1
Schedule:	<u>Start</u>	<u>End</u>	
	Jun 1998	Continuing	
Database:	<i>Title:</i>	Acquisition Portfolio Scheduling Costing/Optimization Model Database	
	<i>Description:</i>	Production profiles and costs for over 100 ACAT1 and pre-MDAP systems and over 40 production facilities.	
	<i>Automation:</i>	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		
	“Econometric Modeling of Acquisition Category I Systems at the Raytheon Plant in Tucson, Arizona”, IDA Paper P-3648		
	“Portfolio Optimization Feasibility Study”, IDA Document D-2325.		
Keywords:	Estimating, Weapon Systems, Production, Acquisition Strategy, Mathematical Modeling, Mathematical Model		

IDA-33

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 (PfP) program. IDA also works with selected PfP countries to help strengthen their overall defense resource management processes. During these visits, IDA works with the host country to develop and 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 4850 Mark Center Drive Alexandria, VA 22311-1882 Mr. David A. Drake, (703) 845-2573

Resources:	<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
	1993	\$25,000	0.2
	1994	\$288,000	1.9
	1995	\$550,000	3.5
	1996	\$800,000	5.0
	1997	\$1,200,000	7.5
	1998	\$1,100,000	6.9
	1999	\$1,437,000	9.0
	2000	\$1,690,000	10.6
	2001	\$1,325,000	8.3
	2002	\$2,165,000	12.0
	2003	\$1,600,000	8.0

Schedule: Start End
 Sep 1993 Indefinite

Database: None

Publications: DRMM Cost Modules Users Manual

Keywords: Government, Programming, Forces, Life Cycle, Fixed Costs, Variable Costs, Mathematical Modeling, Computer Model

IDA-34

Title: Analytical Support for the Test and Evaluation Science and Technology (TEST) Program

Summary: IDA activities include research, analyses and special studies to support the management and execution of the TEST Program. Task activities include providing resource analysis, research and analyses of promising technologies, determination of alternative contracting strategies, recommendations on the selection of research and developmental projects, conducting special studies, development of analyses to support preparation of management and resource documentation, and monitoring of research project progress.

Classification: Unclassified

Sponsor: Deputy Director, Resources and Ranges (DOT&E/S&TR)
 Director, Operational Test and Evaluation (DOT&E)
 Suite 1000
 4850 Mark Center Drive
 Alexandria, VA 22311
 Mr. M. Crisp, (703) 681-4000 ext102

Performer: IDA
 4850 Mark Center Drive
 Alexandria, VA 22311-1882
 Mr. W. Andrew Wisdom, (703) 845-6962

Resources:	<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
	2001	\$ 50,000	.25
	2002	\$300,000	1.5
	2003	\$300,000	1.5

Schedule: Start End
 Oct 2002 Sep 2003

Database: None

Publications: None

Keywords: Government, Analysis, Test and Evaluation

IDA-35

Title: Resource Analysis for T&E - CTEIP

Summary: IDA activities include research, analyses and special studies to support planning, management and effective execution of the Central Test and Evaluation Investment Program (CTEIP). Primary activities focus on resource analysis to support budget planning, resource allocation to developmental projects, and tracking project-level fiscal execution. Other analysis activities include review of technical justification and documentation for developmental projects to meet joint and/or multi-Service test requirements, identification of project execution issues, and the development of proposed corrective contract or management alternatives.

Classification: Unclassified

Sponsor: Deputy Director, Resources and Ranges (DOT&E/S&TR)
Director, Operational Test and Evaluation (DOT&E)
Suite 1000
4850 Mark Center Drive
Alexandria, VA 22311
Mr. M. Crisp, (703) 681-4000 ext102

Performer: IDA
4850 Mark Center Drive
Alexandria, VA 22311-1882
Mr. W. Andrew Wisdom, (703) 845-6962

Resources:

<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
2000	\$850,000	4.0
2001	\$900,000	4.0
2002	\$950,000	4.5
2003	\$950,000	4.5

Schedule:

<u>Start</u>	<u>End</u>
Oct 2002	Sep 2003

Database: None

Publications: None

Keywords: Government, Analysis, Test and Evaluation

IDA-36

Title: Industrial Sector Capability Analysis

Summary: Provide assessments of various weapon production sectors to support DUSD(IP) 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 affect the industrial base. Recently completed sector analyses were Missiles/ Precision Guided Munitions and Unmanned Aerial Vehicles. Efforts under this task supported Suzanne Patrick (DUSD/IP) in her production of the report "Transforming the Defense Industrial Base: A Roadmap". The task also provides rapid turnaround assessments of breaking issues, particularly the impact of proposed mergers involving defense contractors. The task has created and is maintaining a website to allow rapid access to a variety of industrial base research materials, for use by both IDA and sponsor staff.

Classification: Unclassified Proprietary

Sponsor: DUSD(IP)
3300 Defense Pentagon (Room 3E1060)
Washington, DC 20301-3300

Mr. BJ Penn (703) 607-4046, Mr. Victor Ciardello (703) 601-5001,
Ms. Dawana Branch (703) 602-4324

Performer: IDA
4850 Mark Center Drive
Alexandria, VA 22311-1882
Mr. James Woolsey, (703) 845-2133

Resources:

<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
2001	\$700K	3.7
2002	\$1.69M	8.5

Schedule:

<u>Start</u>	<u>End</u>
Jan 2001	Sep 2003

Database: N/A

Publications: TBD

Keywords: Industry, Analysis, Review/Monitoring, Policy, Aircraft, Missiles, Facilities, Infrastructure, Production, Labor, Material, Overhead/Indirect, Manufacturing, Fixed Costs, Variable Costs, Production Rate, Acquisition Strategy, Data Collection, Survey, Economic Analysis, Database, Study.

IDA-37

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 cost analysis capability on their Staff and assisting the MND in developing a similar capability in the Ministry of Defense. 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 have been conducted jointly by IDA and KIDA.

Classification: Unclassified

Sponsor: IDA
4850 Mark Center
Alexandria, VA 22311-1882
Dr. Stephen J. Balut, (703) 845-2527, sbalut@ida.org

Performer: IDA

Resources:

<u>FY</u>	<u>Dollars</u>	<u>Staff-years</u>
2003	\$28,000	

Schedule:

<u>Start</u>	<u>End</u>
Oct 2002	Sep 2003

Database: None

Publications: N/A

Keywords: Estimating, Life Cycle, Case Study

IDA-38

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
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Performer: IDA

Resources: FY Dollars Staff-years
2003 \$10,000

Schedule: Start End
Jan 2003 May 2003

Database: None

Publications: Course material

Keywords: Estimating, Analysis

IDA-39

Title: Cooperation with MinDef, Singapore

Summary: The Institute for Defense Analyses (IDA) and the Ministry of Defense (MinDef) of Singapore have established collaborative links for the purpose of pursuing topics of mutual interest and benefit. In January, 2003, a workshop was conducted on the topics of Cost Estimation of Development Systems, Political Islam, and Effects-Based Operations. Another workshop will be conducted later in 2003. These workshops improve IDA's understanding of Asian defense issues, which, in turn, is applied to our work in support of the DoD.

Classification: Unclassified

Sponsor: IDA
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Performer: IDA
Dr. Stephen J. Balut, (703) 845-2527. sbalut@ida.org

Resources: FY Dollars Staff-years
2003 50,000

Schedule: Start End
Oct 2002 Sep 2003

Database: N/A

Publications: TBD

Keywords: Policy, Review

IDA-40

Title: Improving Defense Resource Management

Summary: Secretary Rumsfeld made it clear he wants the defense resource management system to be more responsive, more flexible and to involve less work for DoD Staffs. IDA is sponsoring independent an effort to identify possible improvements in defense resource management that align with the Secretary's desires. Particular attention is being paid to information systems that support DoD's decision processes.

Classification: Unclassified

Sponsor: IDA
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Performer: IDA
Mr. Ron Porten, 703 845-2145, rporten@ida.org

Resources:	<u>FY</u>	<u>Dollars</u>	<u>Staff Years</u>
	2003	\$20,000	0.1
Schedule:	<u>Start</u>	<u>End</u>	
	Oct 2002	Sep 2003	
Database:	None		
Publications:	Pending		
Keywords:	Government, Policy, Programming, Budgeting, Review, Study		

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14. ABSTRACT Every year, at the IDA Cost Research Symposium, the OSD's Cost Analysis Improvement Group (CAIG) meets with representatives from other offices and organizations involved in defense-related cost research to discuss ongoing and planned cost studies. Selected government offices, Federally Funded Research and Development Centers, and military universities are among the organizations represented. The theme of the 2003 IDA Cost Research Symposium was the cost of evolutionary acquisition/spiral development. This document contains presentations made by symposium panel members on various topics related to the theme. Included are individual service assessments of DoD's capabilities to estimate related costs. The summaries of current and planned cost research projects at the offices and organizations that participated in this year's symposium are contained in an appendix.					
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