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INSTITUTE FOR DEFENSE ANALYSES

2002 IDA Cost Research Symposium: Estimating the Costs of Transforming U.S. Military Forces

Stephen J. Balut, Project Leader
Gary R. Bliss
Leonard P. Cheshire
John J. Garstka
David W. Henningsen
Jay H. Jordan
Joel B. Resnick
Russell A. Vogel

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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 studies. 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 2002 cycle. Its purpose is to make the material available to those who participated in the 2002 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/Centers in the relevant defense components provide independent estimates for other MDAPs.

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

The 2002 IDA Cost Research Symposium was held on May 23, 2002. The symposium, jointly sponsored by OSD CAIG and IDA, has been held every year since 1989 (see References [2 through 15]). This document contains the proceedings of the 2002 symposium and catalogs defense cost research projects in progress or planned at the time of the symposium.

A. Agenda and Participants

Table I-1 is the agenda for the symposium. The theme was the cost of transforming U.S. military forces to meet the challenges of the twenty-first century. 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 David McNicol, Chairman of the OSD CAIG.

Invited guests then gave presentations that described the information age transformation of the DoD, metrics for transformation, and the role of cost analysts in the new defense environment. Chapters III through V contain annotated versions of these presentations.

Table I-1. Agenda for the 2002 IDA Cost Research Symposium

Welcome and Opening Remarks—*Stephen Balut, IDA*
Keynote Address—*David McNicol, OSD CAIG*
Invited Presentations
Network-Centric Operations and the Information Age Transformation of the DoD *John Garstka, OSD*
Metrics for Transformation—*Joel Resnick, IDA*
Role of Cost Analysts in the New Defense Environment—*Gary Bliss, OD PA&E*
Estimating the Costs of Transformation
OSD Perspective—*Russell Vogel, OSD CAIG*
Navy Perspective—*Leonard Cheshire, NCCA*
Air Force Perspective—*Jay Jordan, AFCAA*
Army Perspective—*David Henningsen, CEAC*
Summary—*Russell Vogel, OSD PA&E*

The last set of invited presentations discussed current capabilities to estimate the costs of transformation from the perspective of the OSD and the individual services. These presentations were updates to similar presentations given at the 2002 DoD Cost Analysis Symposium. Finally, Russell Vogel, Executive Secretary of the CAIG, summarized the topic. These last five presentations are contained in Chapters VI through X.

B. Ongoing and Planned Research Studies

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

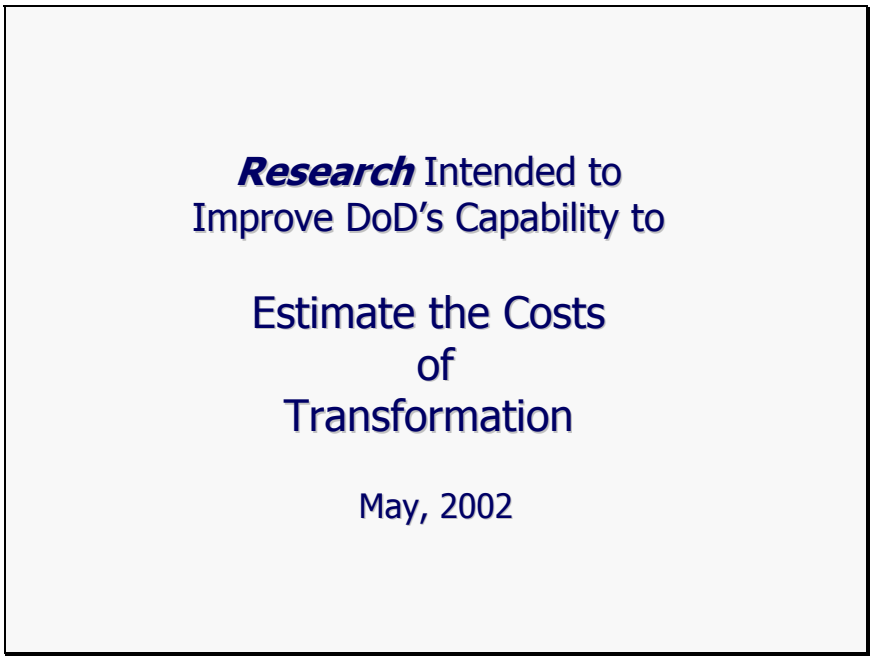
At IDA's request, participants prepared summaries of ongoing and planned cost research studies at their offices and organizations. These were supplied to IDA for use at the symposium and in this document. Appendix A of this document lists the titles of the studies. Appendix B contains the study summaries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

Table I-2. Participants in the 2002 IDA Cost Research Symposium

Office/Organization	Abbreviation	Representative
Office of the Director, Program Analysis and Evaluation	PA&E	David McNicol
Missile Defense Agency	MDA	Lowell Neaf
Army Cost and Economic Analysis Center	CEAC	Robert Young
Army Materiel Command[a]	AMCRM	Kenneth Freund
Army Tank-automotive and Armaments Command	TACOM	Richard Bazzy
Army Aviation and Missile Command[a]	AMCOM	Frank Lawrence
Army Space and Strategic Defense Command	SMDC	Jackson Calvert
Naval Center for Cost Analysis	NCCA	David Ziemba
Office of Naval Research	ONR	Katherine Drew
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	John Trumbule
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]	AFSMC	Deidr Wong
Electronics Systems Center, Air Force Material Command[a]	ESC/FMC	Ron Phillips
UK Ministry of Defence, Pricing and Forecasting Group/ Cost Forecasting	PFG/CF	Terry Proffitt
Air Force Institute of Technology	AFIT/ENV	Robert Calico
Defense Systems Management College[a]	DSMC	John Horn
Aerospace Corporation	AERO	Carl Billingsley
MITRE Corporation	MITRE	Paul Garvey
RAND Corporation	RAND	John Graser
CNA Corporation	CNAC	Matthew Goldberg
Institute for Defense Analyses	IDA	Stephen Balut

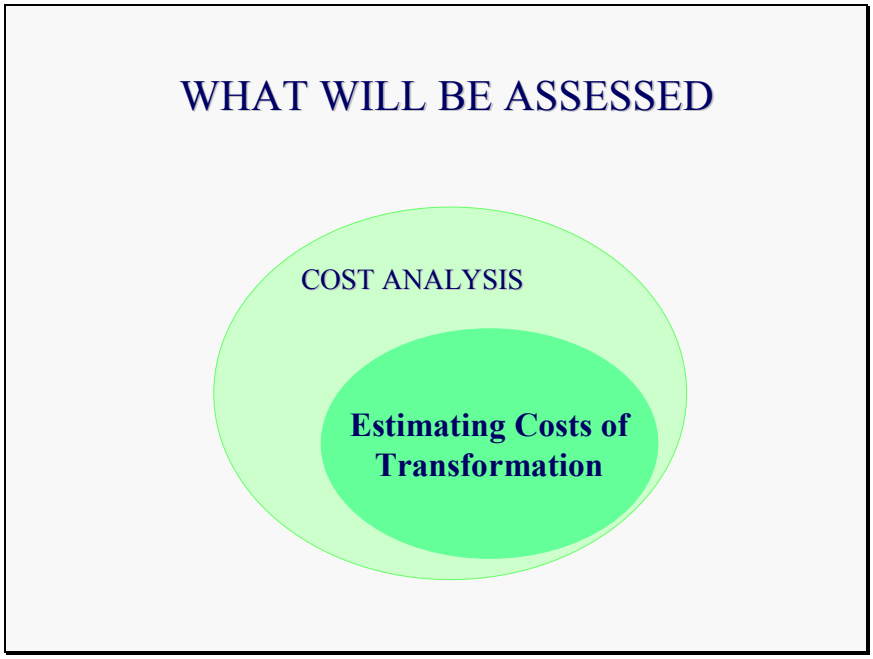
[a] These offices/organizations did not submit project summaries this year.

II. Opening Remarks, Stephen Balut

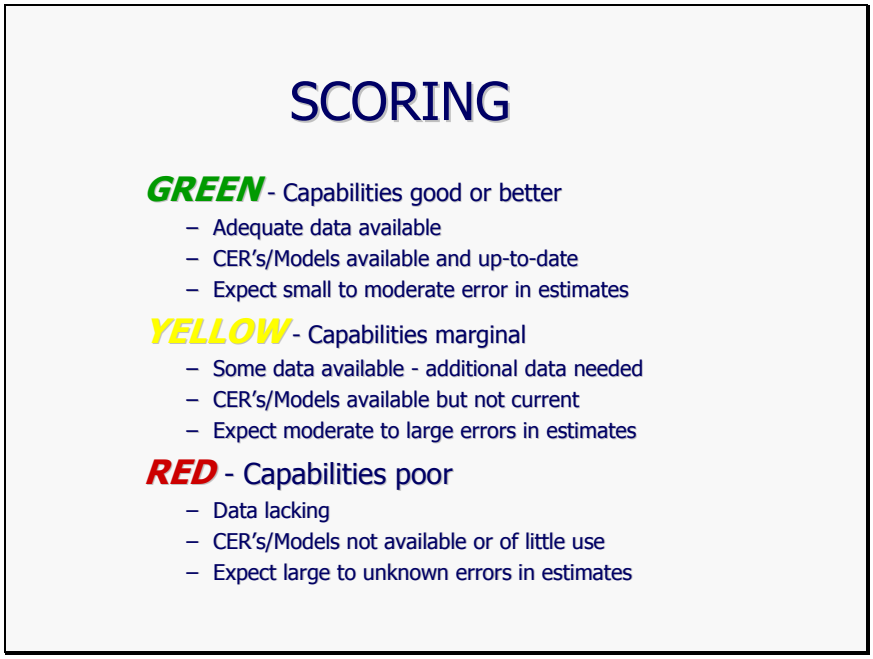


The sequence of presentations that follow will identify research intended to improve DoD's capabilities to estimate the costs of transforming U.S. military forces. Areas needing improvement at this time were revealed at the DoD Cost Analysis Symposium (DoDCAS) held in February 2002. Earlier assessments conducted in 1998, 1999, and 2001 were recently updated by surveying cost analysts who are responsible for estimating the costs of weapon systems at major milestone decision points.

The assessments of DoD's capabilities presented at DoDCAS will be repeated here today and include identification and discussion of areas where improvement is needed most. Today, panel members will list and discuss ongoing or planned research projects that address the areas where improvement is needed. The source used by panel members to identify research projects was a catalog of cost research projects sponsored or conducted by DoD offices, Federally Funded Research and Development Centers, and Defense Universities. This catalog was prepared by IDA based on submissions by offices that sponsor or conduct defense cost research. These offices are represented here today.



The results of assessments you will see do not address all of cost analysis, only DoD's current capabilities to estimate the costs of transformation.



DoD offices that face the challenge of estimating the cost of transformation were asked to provide assessments using the color-coded scoring scheme shown on this slide.

Scoring represents the capability of the military service providing the assessment.

Scoring was subjective—sometimes by individuals, sometimes by groups of individuals.

This slide shows the agenda for the remainder of the symposium. Invited speakers will describe transformation, after which the panel will provide assessments of DoD's capabilities to estimate related costs.

III. Network Centric Operations and the Information Age Transformation of the DoD, John Garstka

Network Centric Operations and the Information Age Transformation of DoD

Presentation to
IDA Cost Research Symposium
23 May 2002

Mr. John J. Garstka
Asst. Director for Concepts and Operations
Office of Force Transformation
Office of the Secretary of Defense
(703) 696-4141
john.garstka@osd.pentagon.mil

Objective

- **Help You Understand:**
  - ***U.S. DoD Transformation***
    - ***Perspectives***
    - ***Goals***
  - ***Network Centric Warfare (NCW)***
    - ***Relationship to Transformation***
    - ***Tenets of NCW***
    - ***New Type of Information Advantage***
    - ***Evidence for Warfighting Advantage***
  - ***Investment Implications***
    - ***Return on Investment on IT in Warfare***
    - ***Complex "Value Proposition"***

Perspective of the Commander in Chief

"… we must build forces that draw upon the ***revolutionary advances in the technology of war*** that will allow us to keep the peace by redefining war on our terms. I'm committed to building a future force that is defined less by size and more by mobility and swiftness, one that is easier to deploy and sustain, one that relies more heavily on stealth, precision weaponry and ***information technologies***.

President George W. Bush
Graduation Address
U.S. Naval Academy, May 25, 2001

Commander in Chief's Perspective (Cont.)

"Building tomorrow's force is not going to be easy. Changing the direction of our military is like changing the course of a mighty ship -- all the more reason for more research and development, and all the more reason to get started right away.

Yet, building a 21st century military will require more than new weapons. It will also

transform

that a 21st century military will need."

Transforming Defense

- ***The Force***
- ***The Management of Defense***
- ***The Role of Defense in National Security***

Vision: A Broad and Sustained Competitive Advantage

Transforming Defense

Elements of Transformation

☑ Continuing process
☑ Creating/anticipating the future
☑ Co-evolution of concepts, processes, organizations, and technology
☑ New competitive areas/competencies
☑ Fundamental shifts in underlying principles
☑ New sources of power
☑ Sustained competitive advantage

Transforming Defense

…Compelling needs and opportunities

- The broad transition from the Industrial Age to the Information Age.
- The appearance of an expanded array of threats in a more uncertain context.
- The vast array of technological opportunities available to friend and foe alike.
- The falling barriers to competition in domains.

To the extent we do no not transform, we are at risk strategically

Transforming Defense

…Strategy

•Transform from the Industrial Age to the Information Age
Implement Network Centric Warfare

•Ensure sustained competitive advantage
Assure Allies
Dissuade competitive entry
Underwrite deterrence
Implement countervailing strategies

•Broaden the capabilities base
Operational, Technical, Industrial
Create new competitive areas
Revalue competitive attributes for the information age
Decrease capabilities cycle time

•Leverage U.S. advantages and opportunities
And manage the devolution of "sunset" capabilities and processes

Achieve Speed and Agility vice Optimization

Transforming Defense

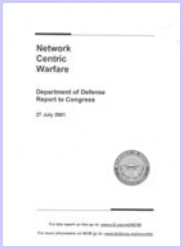
"The most important transformation that we're facing is the transformation from the Industrial to the Information Age. To the extent we do that well, all our other efforts in transformation will prosper. To that extent we don't, all of those efforts will be for naught."

VADM A.K. Cebrowski, USN (Ret)
Director, Office of Force Transformation
Remarks at National Defense University
January 31, 2002

DoD Report to Congress on Network Centric Warfare

Findings:

- **Progress is being made toward understanding basics of NCW concepts and contribution to mission success**
- **Early experimentation by JFCOM and Services point to *continued investment in development of NCW as cornerstone enabler***
- **There are significant impediments to progress**



Conclusions:

- **There is considerable and growing urgency associated with removing the impediments to progress.**
- **Timely removal (or mitigation) of impediments will be facilitated by an OSD-level Office of Transformation.**
- **A goal to achieve specific network-centric capability by a specific date is needed.**
- **NCW offers unprecedented promise to achieve long sought-after capabilities without corresponding increases in resources *in the long run.***
- ***NCW and Network Centric Operations should be the cornerstone of DoD's strategic plan for the transformation of the forces.***

Network Centric concepts can be applied to all of our operations—across the full spectrum of our activities, organizations, and inter-agencies—to achieve the transformation we are seeking.

This message was delivered in the Department of Defense's recently completed Report to Congress on Network Centric Warfare, which was signed by the DEPSECDEF in Aug, 2001.

Joint Staff/J6 and ASD(C3I) were co-leads for the development of NCW Report.

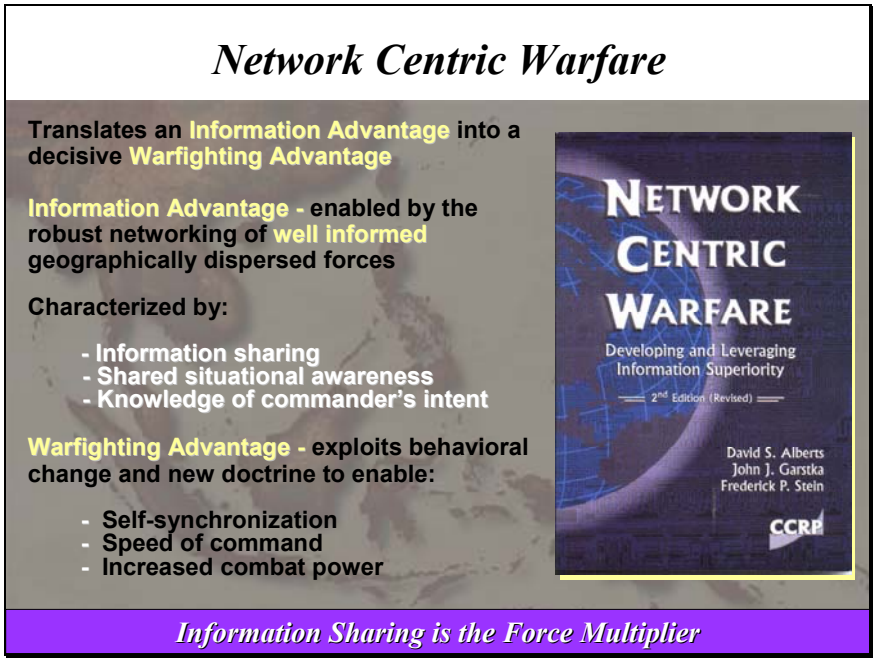
Report had coordinated inputs from CINCS, Services, and Agencies.

Report highlighted that the network is the enabler, but the source of power is central to the success of DoD's ongoing transformation is *information sharing.*

Report highlighted impediments to progress that must be overcome to enable network-centric operations:

- Lack of secure, robust connectivity and interoperability.
- Intolerance of disruptive innovation.
- Lack of understanding of key aspects of human and organizational behaviors.
- Lack of NCW-related technology investments.

Many challenges must be overcome to achieve mature NCW capabilities, but as with previous revolutions in military affairs, leadership will play the decisive role in creating the conditions for transformation.



Network Centric Warfare (NCW) is the embodiment of an Information Age transformation of the DoD.

NCW involves a new way of thinking about:

- how we accomplish our missions
- how we organize and interrelate
- how we acquire and field the systems that support us

Network-centric warfare is enabled by the robust networking of the warfighting force and the supporting DoD enterprise.

Networking enables the force to create an asymmetric information advantage that is based on information sharing.

Sharing information, knowing where the enemy is, where you are, where your buddies are and sharing that information across every weapons platform in the fight enables the force to develop shared situational awareness and creates a significant force multiplier.

A mature network-centric force has the ability to share information between sensors, *regardless of platform*, between commaders, *regardless of location*, and shooters, *regardless of service.*

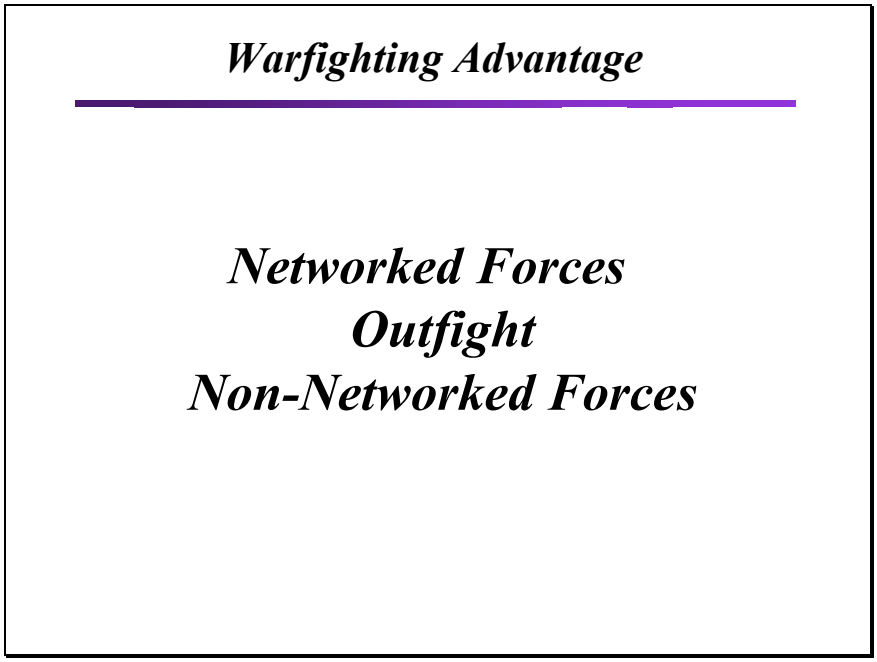
This definition may sound simplistic, but it describes a force that doesn't exist in *a mature state* in the armed forces of any military today. For example, how well are we netted across the Across services? From sensors to shooters? The interagency? National forces to allies?

NCW moves the department to the next level of Jointness envisioned in *Joint Vision 2020."*

Sharing information, knowing where the enemy is, where you are, where your buddies are and sharing that information across every weapons platform in the fight creates and incredible force multiplier.

This is not a new idea but we've never really fully implemented the concept across the full joint or inter-agency organizations to the extent necessary to be the ultimate fighting force…where it has been implemented, success has followed. (Details on next slide)

Look at the way the Air Force manages an air battle. How different and less lethal would the AF be if we withdrew the AWACS from the picture? How about if we removed the AEGIS radar from Navy Theater Air Missile Defense—or if we limited the AH-64Ds ability to identify blue forces?



Warfighting Advantage: Evidence

- **Dominant Maneuver**
  - **Digitized forces demonstrate capability to fight over a much larger area with fewer forces than non-digitized forces (USA Division Capstone Exercise - Phase I, Apr 2001)**
- **Precision Engagement - Counter Anti Access**
  - **Networked combined force requires 62% less time to restore mine free shipping in Strait of Hormuz (FBE Foxtrot, Dec 1999)**
- **Precision Engagement - Counter SOF (CSOF)**
  - **Decision cycle reduced by half - shooter effectiveness increased**
  - **10 fold reduction in SOF penetrators by water (FBE Delta, Oct 1998)**
- **Full Dimensional Protection - Counter Air**
  - **USAF found F-15Cs, working with data links (shared awareness), increased kill ratio by over 100% -- 2.6:1 for both Day & Night Ops (JTIDS Operational Special Project - Mid 1990's)**

Questions

- What allows networked forces to outfight non-networked forces?
  –
- What is the linkage between
  and
- How strong is the evidence?
- What are there implications of NCW for:
  - Armed Forces
  - Defense and IT Companies?

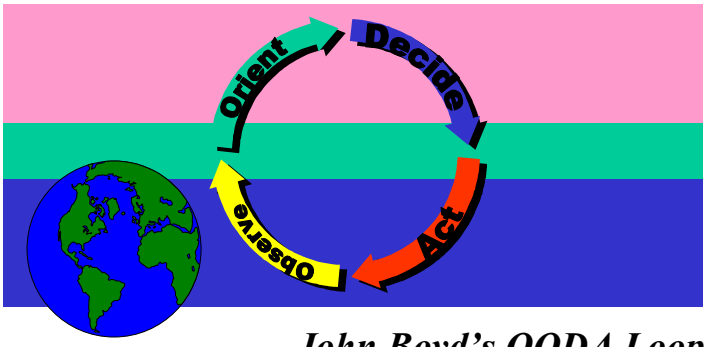
Tenets of Network Centric Warfare

- A robustly networked force improves information sharing
- Information sharing enhances
  - **Quality of Information**
  - **Shared Situational Awareness**
- Shared situational awareness
  - **Enables collaboration and synchronization**
  - **Enhances sustainability and speed of command**
- These, in turn, dramatically increase mission effectiveness

Executive Summary - NCW Report to Congress

Source of Combat Power

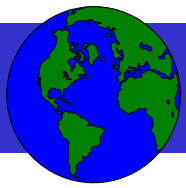
"…source of combat power enabled by NCW concepts can only be understood by focusing on the relationships that take place in and among the domains of warfare."



John Boyd's OODA Loop

Understanding the Domains of Warfare

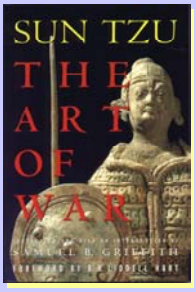
Strike
Maneuver
Protect



"Friction"

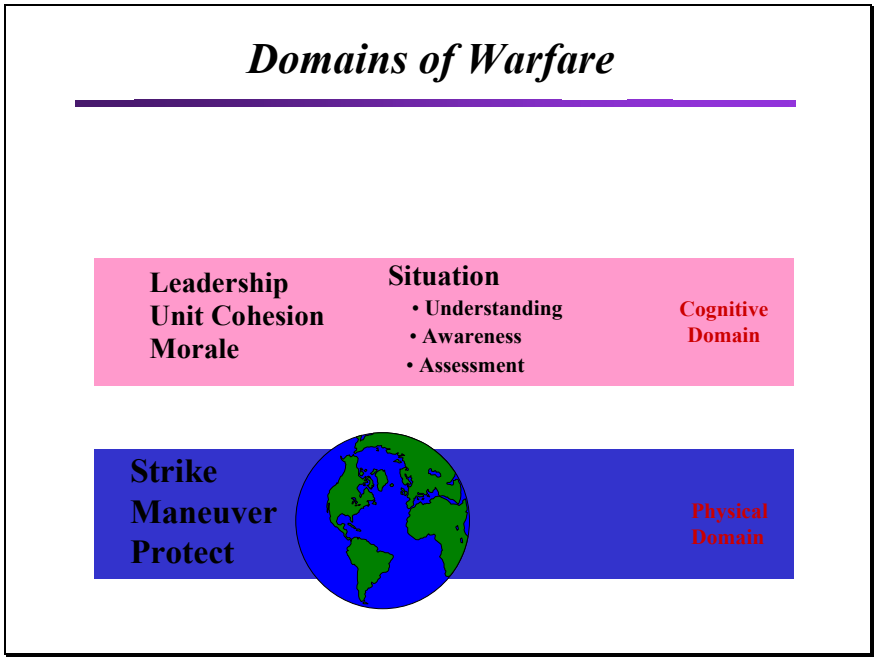
Physical Domain

Information in War: Value of Knowledge



" Know the enemy and know yourself; in a hundred battles you will never know peril. When you are ignorant of the enemy but know yourself, your chances of winning or losing are equal. If ignorant of both your enemy and yourself, you are certain in every battle to be in peril."

Sun Tzu



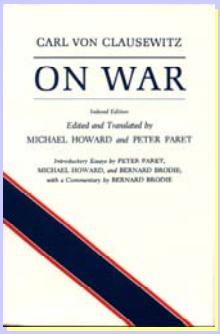
Until quite recent times, the capability to collect, record, store, process, and disseminate information were extremely limited. This in turn limited the ability of commanders to know what was going on and their ability to communicate with their subordinates. These limitations affected the ways in which militaries have been able to operate. Even though many advances have taken place, particularly since the introduction of the telegraph, our ability to collect, process, and dissemination information continue to constraint how we operate today.

In the section on command and control, we will explore the various ways forces have organized, the manner in which command and control has been exercised, and the relationships among organization, command and control, and information and communications technologies. Here we will very briefly review the nature of the advances in information-related technologies, the most significant of which, arguably those related to the internet, have taken place in the last ten years.

For the better part of history information processing took place within the brain and communications was limited to runner, rider, semiphor, drums, or carrier pigeon.

Information in War: Fog & Friction

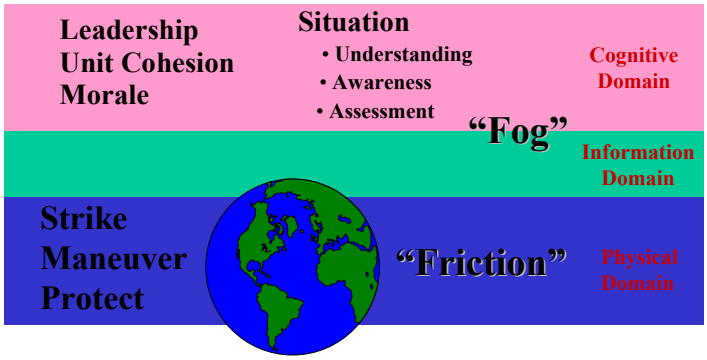
" The general unreliability of all information presents a special problem; all action takes place, so to speak, in a kind of twilight, …. like fog."



"War is the realm of uncertainty; three quarters of the factors on which action in war is based are wrapped in a fog of greater or lessor uncertainty… The commander must work in a medium which his eyes cannot see, which his best deductive powers cannot always fathom; and which, because of constant changes, he can rarely be familiar."

Carl von Clausewitz

Domains of Warfare

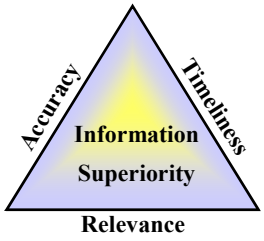


Information Domain

The information domain is the domain where information lives. It is the domain where information is created, manipulated, and shared. It is the domain that facilitates the communication of information among warfighters. It is the domain where the command and control of modern military forces is communicated, where commander's intent is conveyed. Consequently, it is increasingly the information domain that must be protected and defended to enable a force to generate combat power in the face of offensive actions taken by an adversary. And, in the all-important battle for information superiority, the information domain is ground zero.

Executive Summary
NCW Report to Congress

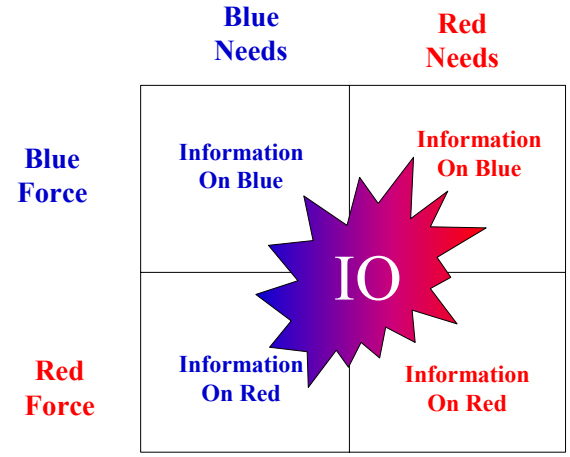
Information Advantage / Superiority



...relative to an adversary...

OURS	***THEIRS***
NEEDS ↓	NEEDS ↑
ABILITY TO SATISFY ↑	ABILITY TO SATISFY ↓

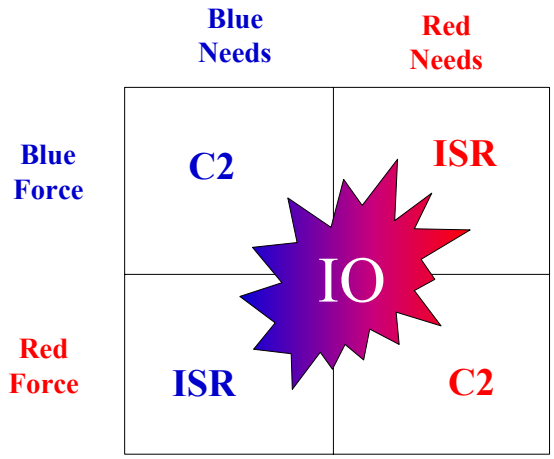
Information Advantage: Information Needs



Information Advantage: Information Needs

Info On:	Individual/ Node	Unit/ Flight	Force
Blue Force	Where am I? Where are my buddies?	Where is the Flight? What is its Disposition?	Where is the Force? What is its Disposition?
Red Force	Where is the Adversary?	Where is the Adversary?	Where is the Adversary? What is the Adversary doing now?

Information Advantage: Information Needs & Approach for Satisfying



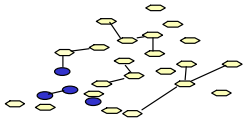
Hard Questions

- How can the ***Blue Force's Information Needs*** be best ***Satisfied***?
- What are the ***implications*** of **Satisfying** these **Needs?**
  - **On the Size and Shape of the Force?**
  - **On How the Force Operates?**
  - **On How the Force can Change?**
- What are the potential trade offs between **Information** and **Mass**?

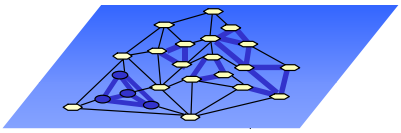
Information Advantage: Allied Breakout From Normandy

- **Creating Information Advantage**
  - Ultra provides Allied Commanders with an ***Information Advantage*** in the form of Information on:
    - German Army positions
    - Intent of German Army Commanders
    - Status and Disposition of German Forces
- **Leveraging Information Advantage**
  - LTG Patton (Commander, US Third Army) leverages ***Information Advantage*** by:
    - Substituting Information for Mass
    - Creating Local Force Advantage
    - Maintaining Initiative

Network Centric Warfare



Platform-Centric Force
Platform-Centric Warfare

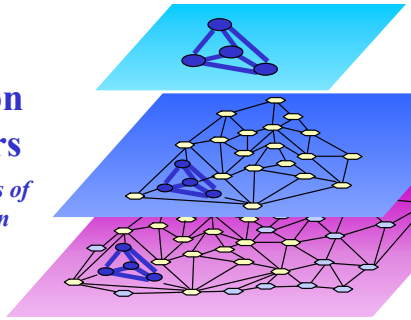


Network-Centric Force
Network-Centric Warfare

The robust *networking* of the force improves information sharing.

Physical Domain

Networking The Force



Sensors
Regardless of Platform

Decision Makers
Regardless of Location

Effecters
Regardless of Service

What is the Priority for Networking?
What is the Linkage to Information Advantage?
What is the Linkage to Warfighting Advantage ?

Network Centric Warfare

Information Sharing **enhances the Quality of Information**

Information Domain

The robust networking of the force improves *Information Sharing.*

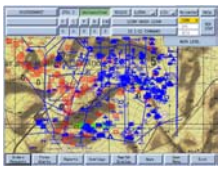
Physical Domain

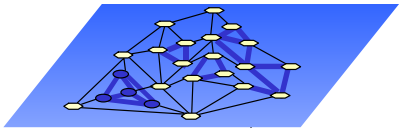
Network Centric Warfare

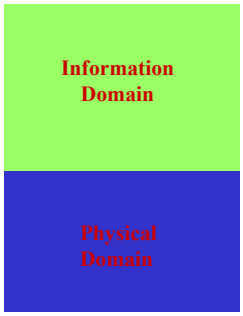
- ***Information Domain*:**
  - **The force has the capability to collect, share, access, and protect information.**
  - **The force has the capability to collaborate in the information domain, which enables a force to *improve its information position* through processes of correlation, fusion, and analysis.**
  - **A force can *achieve information advantage* over an adversary in the Information Domain.**

Information Sharing Enhances the Quality of Information

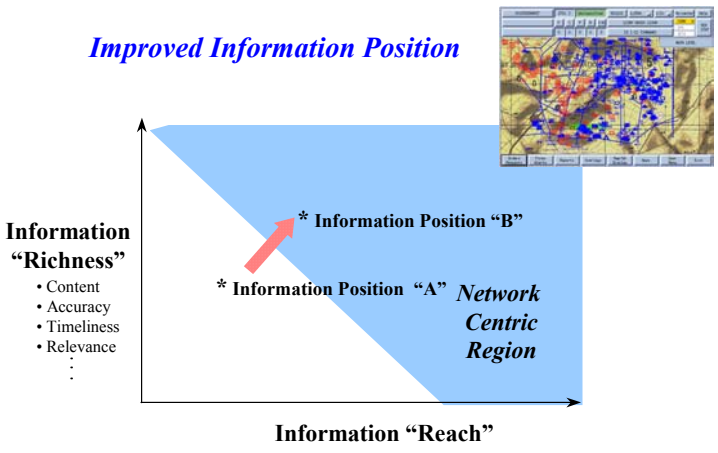
"The force has the capability to collaborate in the information domain, which enables a force to through processes of correlation, fusion, and analysis."





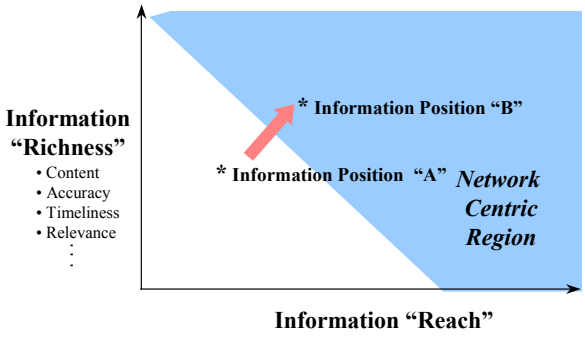


Information Sharing Enhances the Quality of Information



Richness and reach were introduced by Phillip B. Evans and Thomas S. Wurster, "Strategy and the New Economics of Information," ***Harvard Business Review***, September-October 1997.

Information Advantage

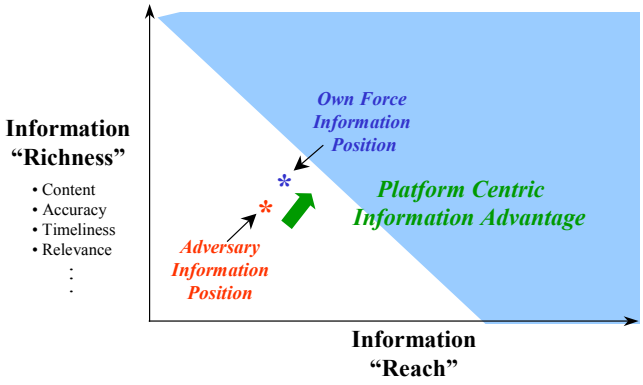


Networking the Force:

- ***Provides Warfighters with Access to a New Region of the Information Domain***
- ***Creates opportunity for a New Type of Information Advantage***

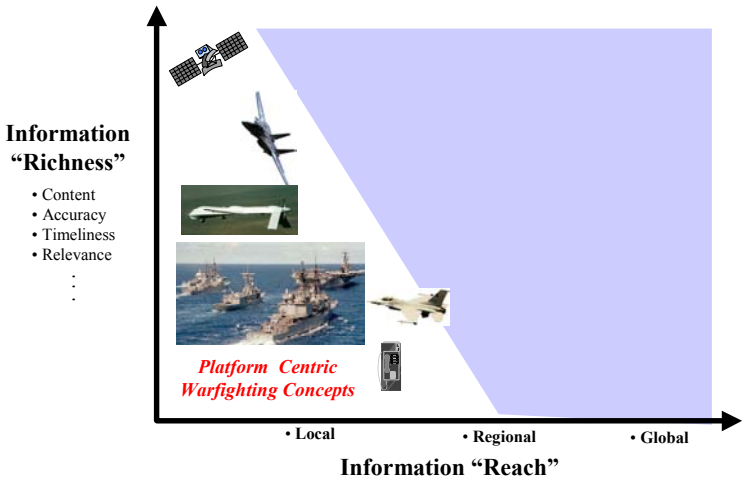
Richness and reach were introduced by Phillip B. Evans and Thomas S. Wurster, "Strategy and the New Economics of Information," ***Harvard Business Review***, September-October 1997.

Information Advantage

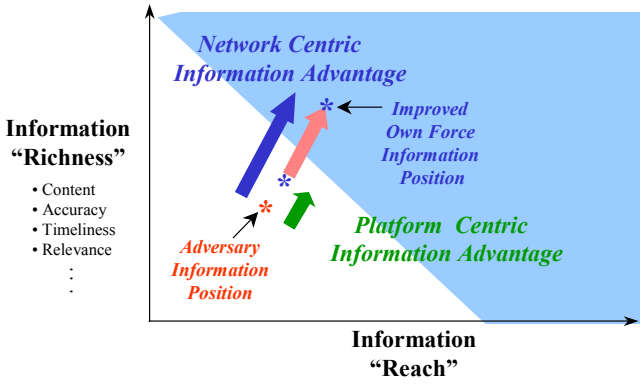


Established Source of Advantage at the Tactical Level of Warfare

Platform Centric Information Advantage

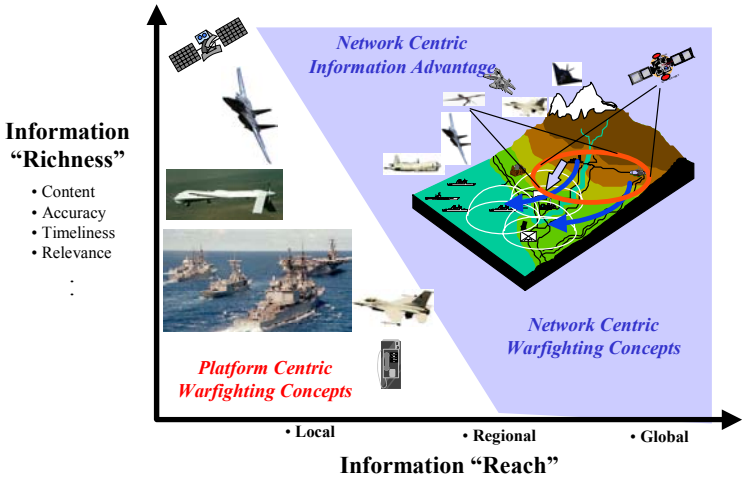


Information Advantage



New Type of Information Advantage is key enabler of increased Combat Power

Network Centric Information Advantage



Network Centric Warfare: Operation Enduring Freedom

- ***Collaborative Engagement with Networked Kill Chain***
  - **Special Forces on Horseback Laser-Designate Targets for JDAM on F-14, F-15E, B-1, B-2**
  - **F-14 Passes Mensurated Target Data to B-52, Enabling Successful Target Kill**

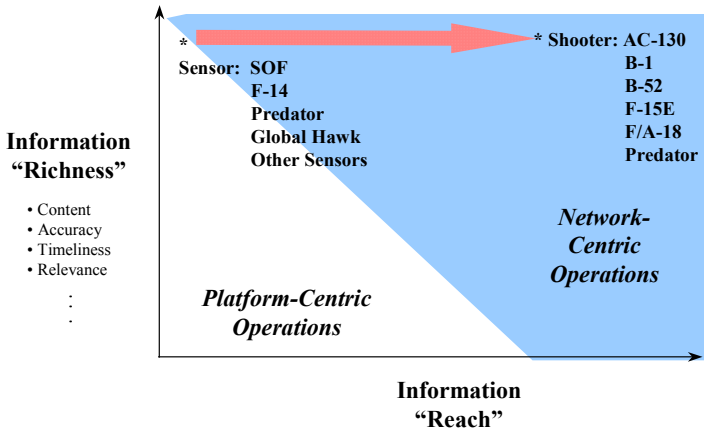
Some real-world examples from Operation Enduring Freedom highlight why it is critical we move rapidly to a network-centric force. These show the power of "brain-to-brain" collaboration across amazing geographic (and cultural!) distances to achieve a single mission objective:

Global Hawks—along with the Hellfire-missile-equipped Predator UAV, F-15E, RC-135 Rivet Joint signals intelligence-gatherer and other key long-range, long-endurance platforms--*are* major parts of an extremely fast "sensor-to-decision maker" system. This system lets allied forces spot, identify, and strike moving targets within a few minutes. These aircraft, many of them with synthetic aperture radar and GPS-guided bombs, will be able to see and strike through heavy clouds

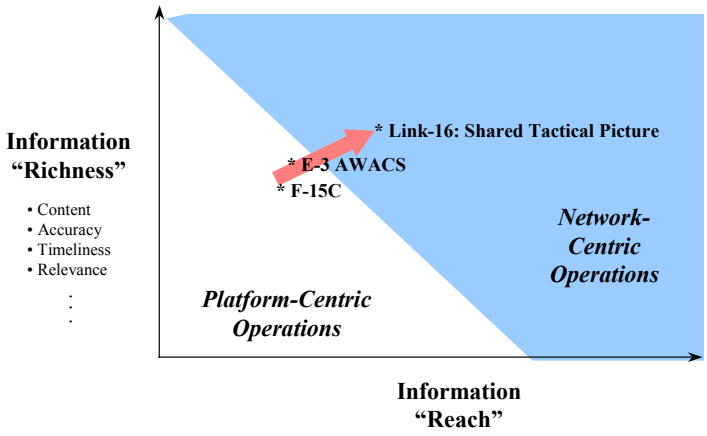
F-14s are delivering highly precise targeting information to other aircraft. During one recent mission, an F-14 was able to provide mensurated data to a B-52. The bomber was able to use the information to successfully attack a target. The targeting information was derived using the F-14's LANTIRN pod, which is fitted with its own GPS. This combination allows the aircraft to determine a target's location with relatively high precision. In the F-14/B-52 teaming arrangement, target coordinates were passed via E-3 AWACS. Eventually, however, that data could be provided directly using Link-16 data links.

Now for the payoff—where all these initiatives and efforts are leading. Let me talk for a few minutes about one of the places where all this information and technological innovation comes together in the AOR to help the air component commander fight the air war—the Air Operations Center (AOC).

Network Centric Warfare: Operation Enduring Freedom

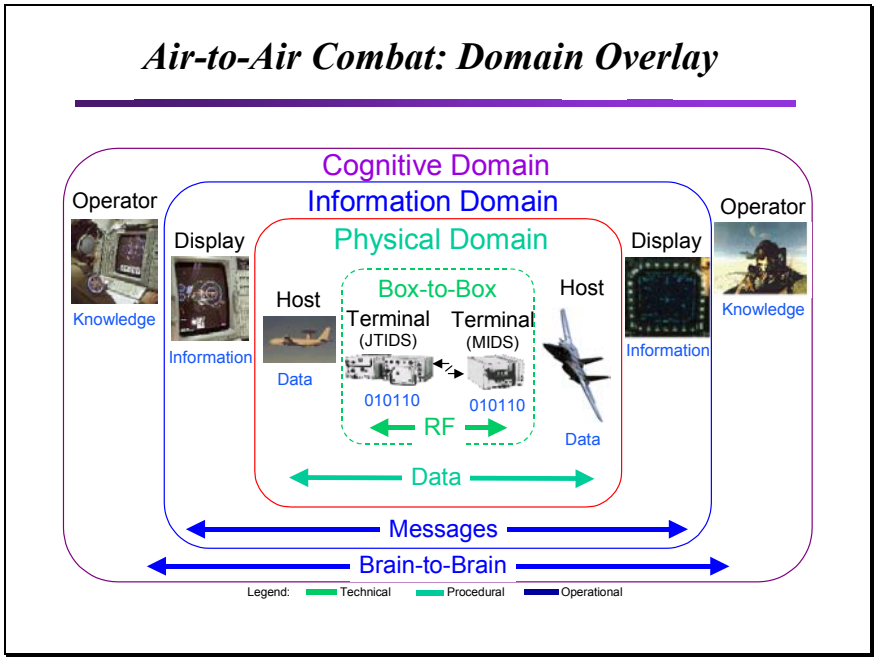


Warfighting Advantage: Air Superiority Mission



Air Superiority Mission: The Combatants

Blue **Red**



Here is a depiction of brain-to-brain collaboration across vast distances enabled by robust physical domains and empowered by consistent information presentations.

Integrating our systems as a network of interrelated capabilities and information is key to meeting the challenges addressed by Gen Jumper in the Global Strike Task Force briefing.

Air-to-Air Combat: The Outcome

F15-C Air Ops: Active Missile Counter Tactics

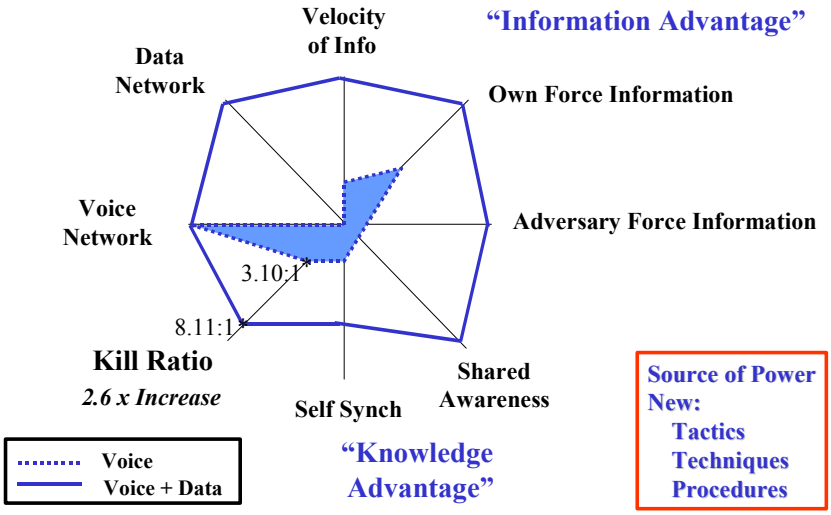
Without JTIDS/With JTIDS

- **Information Advantage** — **Voice Only vs. Shared Tactical Picture**
- **OODA Loop** — **Baseline Compressed with Self-Synchronization**
- **Kill Ratio** — 3.10:1 vs. 8.11:1 (***2.61 x increase***) - Day
  3.62:1 vs. 9.40:1 (***2.59 x increase***) - Night

The Bottom Line: Demonstrated capability for networked aircrews fighting with *shared situational awareness* to increase combat power by over *100 %*

Source: JTIDS Operational Special Project - Report to Congress, Dec 97

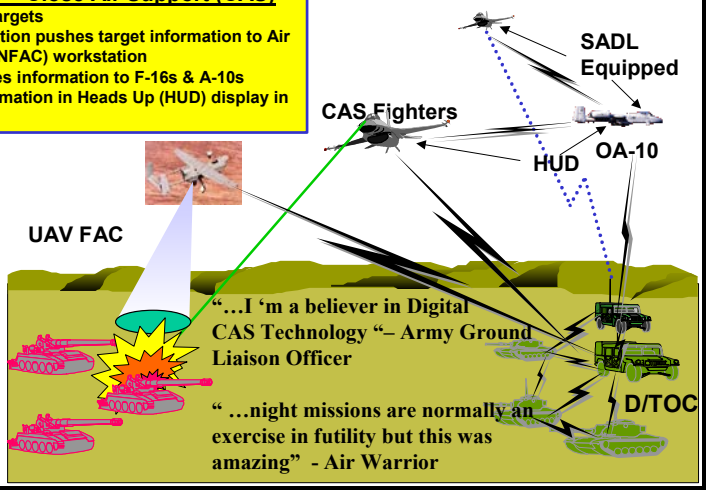
Air-to-Air Combat: Value of Information / Knowledge Advantage



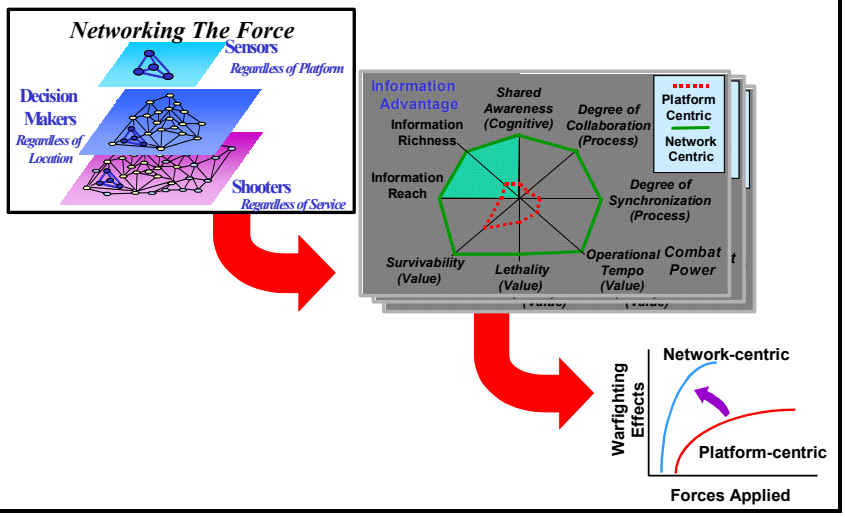
US Army Division Capstone Exercise – Phase I – "Digital CAS"

"Scenario" -- Close Air Support (CAS)

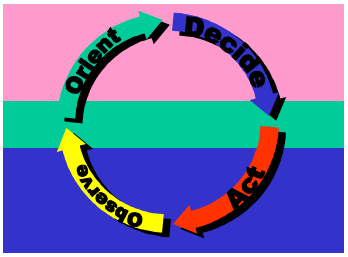
- UAV identifies targets
- UAV Ground-station pushes target information to Air Force SADL (WINFAC) workstation
- WINDFAC pushes information to F-16s & A-10s
- Pilots view information in Heads Up (HUD) display in Cockpit

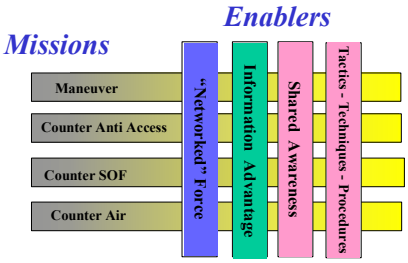


Network Centric Warfare: Measuring Warfighting Advantage



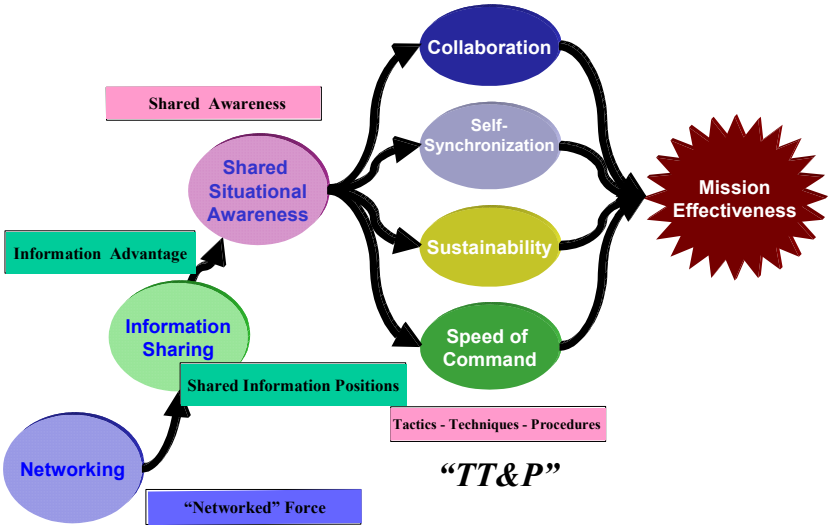
Understanding the Evidence for Warfighting Advantage



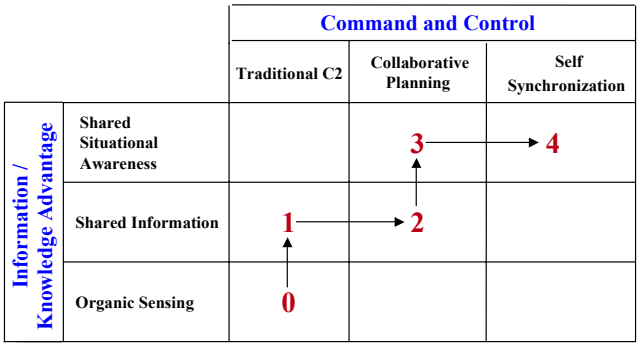


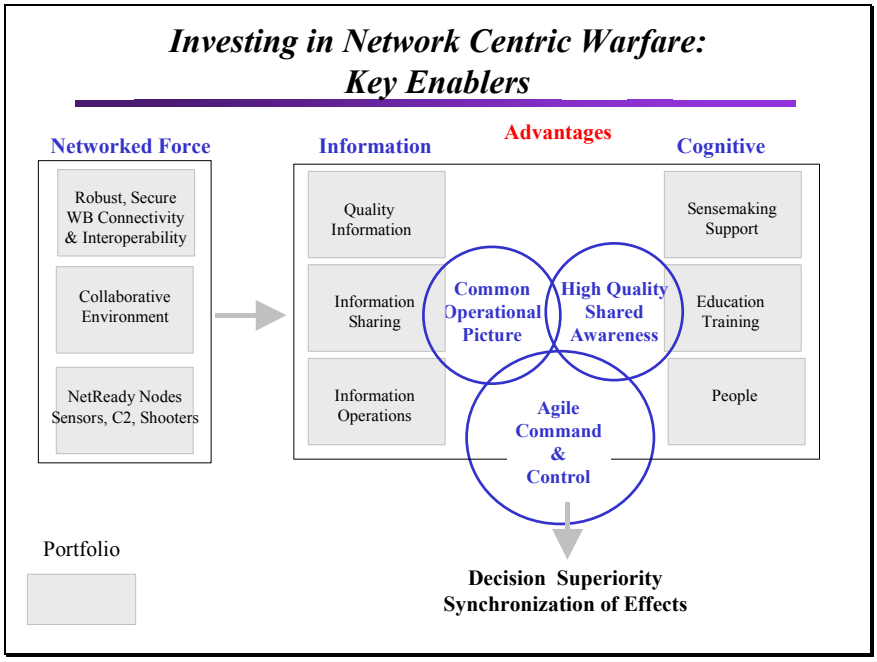
- **Dominant Maneuver**
  - Digitized forces demonstrate capability to fight over a much larger area with fewer forces than non-digitized forces (USA Division Capstone Exercise - Phase I, Apr 2001)
- **Precision Engagement - Counter Anti Access**
  - Networked combined force requires 62% less time to restore mine free shipping in Strait of Hormuz (Fleet Battle Experiment (FBE) Foxtrot, Dec 1999)
- **Precision Engagement - Counter SOF (CSOF)**
  - Decision cycle reduced by half - shooter effectiveness increased
  - 10 fold reduction in SOF penetrators by water (FBE Delta, Oct 1998)
- **Full Dimensional Protection - Counter Air**
  - USAF F-15Cs, working with data links (shared awareness), increased kill ratio by over 100% -- 2.6:1 for both Day & Night Ops (JTIDS Operational Special Project - Mid 1990's)

Understanding the Evidence for Warfighting Advantage



Measuring Maturity of NCW Capabilities





Achieving mature network-centric capabilities will require a focused investment in NCW enablers.

These enablers can be grouped in context of the Physical, Information, and Cognitive Domains, as portrayed in the above graphic.

Taken together, these enablers form the basis for a Mission Capability Package (MCP).

MCPs provide an integrated approach for an informed and focused information age transformation.

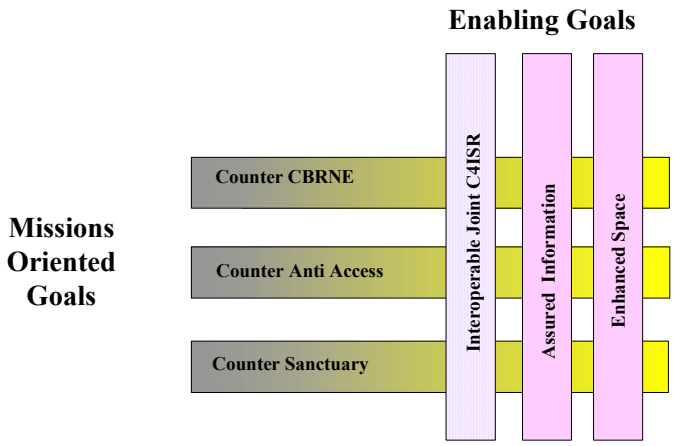
Such an approach is currently being developed by the Office of Force Transformation.

This integrated approach is characteristic of previous RMAs.

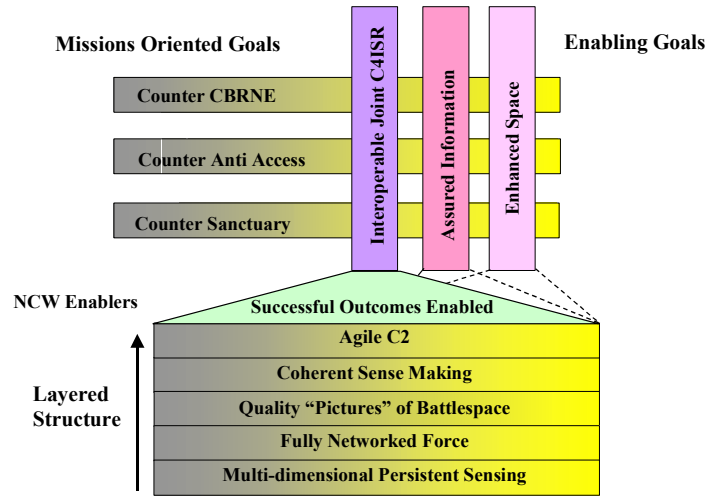
Blitzkrieg, Carrier Aviation, and Amphibious Operations all had technology and doctrinal components that were not effectively understood or addressed by adversaries prior to the onset of hostilities in World War II.

Implication is that transformation must be broader than just "materiel"—must be concept based, and must focus on all dimensions of Mission Capability Packages.

DoD Transformation Goals:
A Perspective



DoD Transformation Goals:
Linkage to NCW Enablers



Major NCW Enablers

Successful Outcomes Enabled: the ability to apply the force in a manner that achieves effects resulting in successful outcomes

Agile C2: the ability to construct and adaptively make needed adjustments to mission specific C2 capabilities and force application

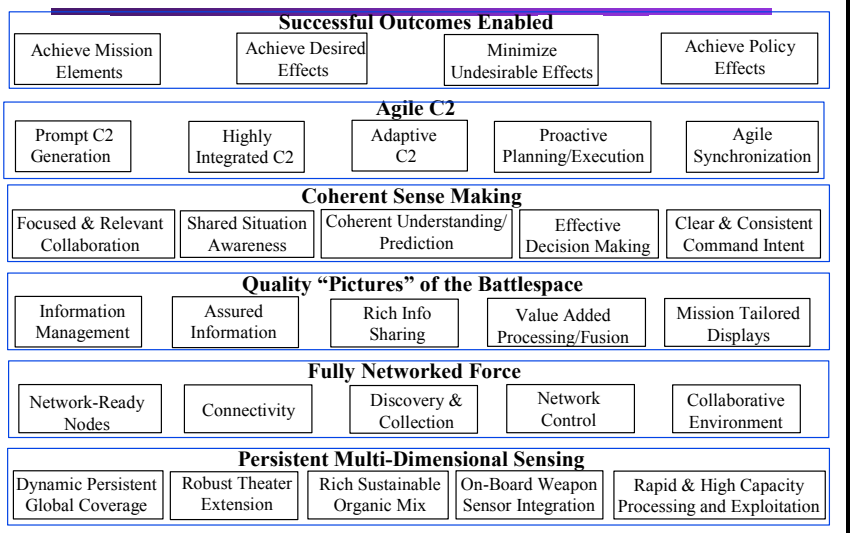
Coherent Sense Making: the ability of individuals to collaboratively interpret the battlespace picture and move an organization towards accomplishing a mission

Quality "Pictures" of the Battlespace: ability to produce/maintain battlespace representations that are tailorable to user needs, rapidly interactive, and sharable

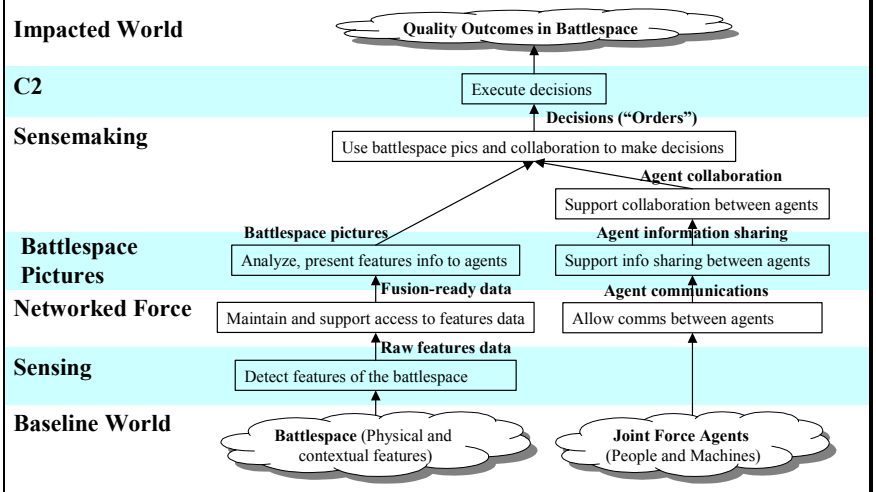
Fully Networked Force: the ability of the network to supply on demand the full range of information services to the joint force

Persistent Multi-Dimensional Sensing: the ability to continually sense and report multiple aspects of the battlespace relevant to the mission

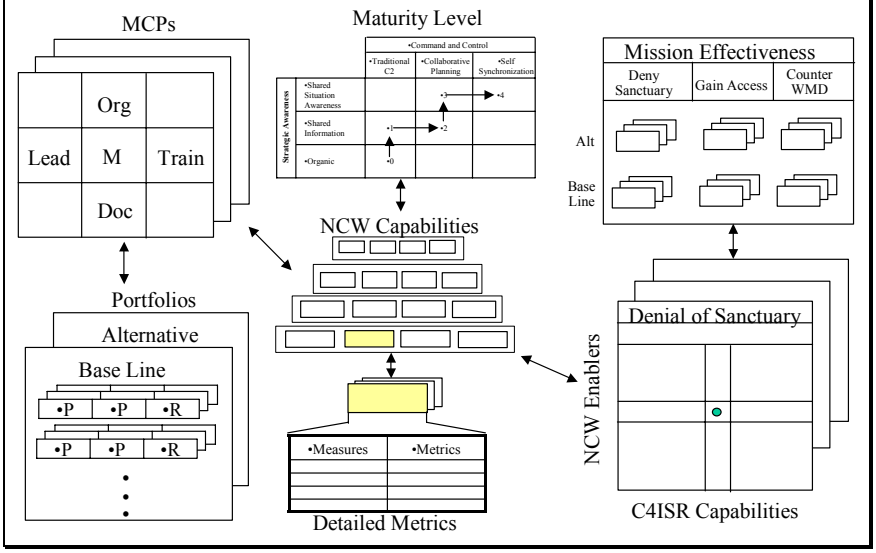
Component Capabilities for NCW Enablers



How NCW Layers Assist in "Quality Outcomes"



Top Level Assessment Methodology



On the Importance of Measurement

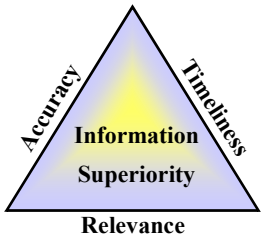
"When you can measure what you are speaking about, and express it in numbers, you know something about it;
but when you cannot measure it, when you cannot express it as numbers, your knowledge is of a meager and unsatisfactory kind;
it may be the beginning of knowledge, but you have scarcely in your thoughts advanced to the stage of science."

Lord Kelvin - 1914

Information Advantage

An Information Advantage Can:

- **Be persistent or transitory**
- **Exist in some areas of the battlespace but not others**
- **Be measured in the context of a task or set of tasks**
- **Be created by taking actions to reduce our information needs and/or increase the information needs of an adversary**
- **Be achieved through the synergistic conduct of:**
  - **Information Operations**
  - **Information Assurance**
  - **Information Gain and Exploit**



Measuring an Information Advantage

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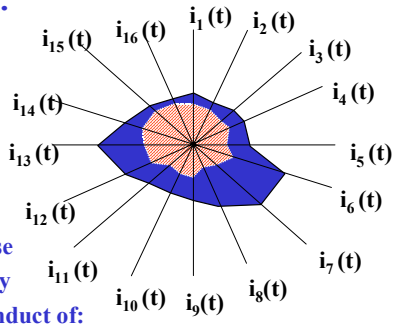


This graphic introduces key attributes of information reach, using a Kiveat Diagram.

Measuring Information Advantage: Metrics for the Information Domain

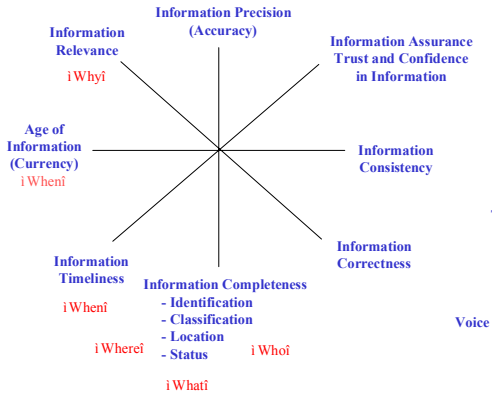
- *Information* **Richness** is an aggregate measure of the
  - Quality of Battlespace *Information,* and
  - Quality of the interactions among entities
- *Information* **Reach** is an aggregate measure of the degree to which *Information* is shared

Richness and reach were introduced by Phillip B. Evans and Thomas S. Wurster, "Strategy and the New Economics of Information," ***Harvard Business Review***, September-October 1997.

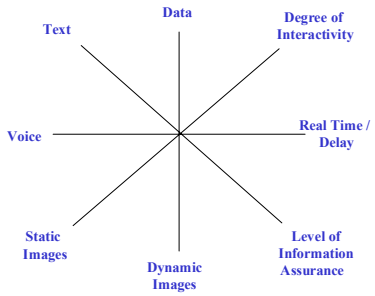
Information Richness is an aggregate measure of the quality of battlespace information and the quality of information interactions among entities.

Information Reach is an aggregate measure of the degree to which information is shared. These aggregate measures can have multiple sub-attributes. Some candidate attributes are discussed in the next two slides.

Measuring Information Advantage: Metrics for the Information Domain



Quality of Information

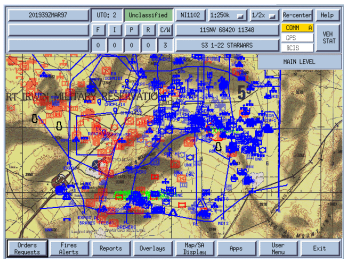


Quality of Interaction

Source: Understanding Information Age Warfare

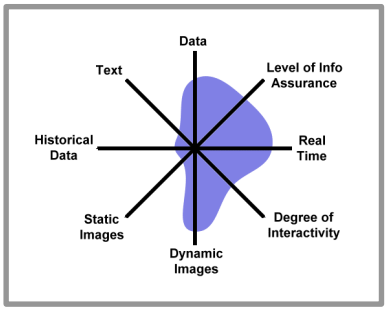
Attributes of a Common Operational Picture

Information Domain



Common Operational Picture

Attributes



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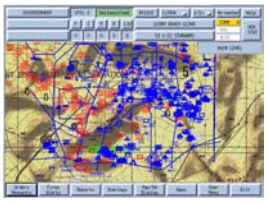
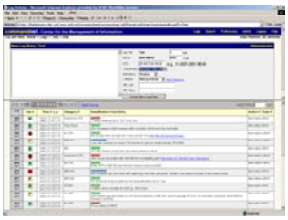
Attributes of an Enhanced Common Operational Picture

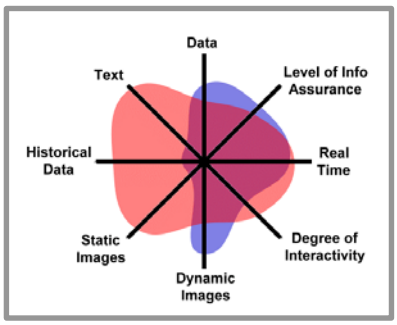
Information Domain



Enhanced Common Operational Picture



Attributes



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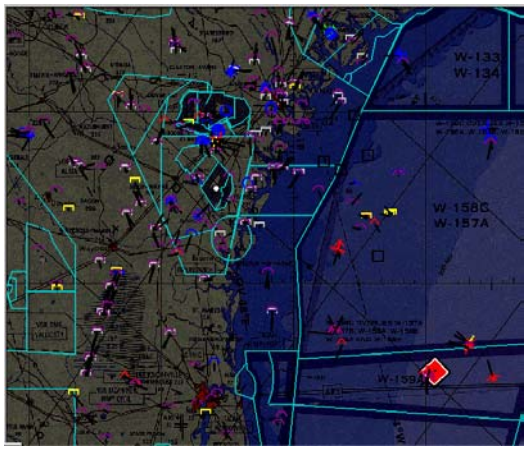
Single Integrated Air Picture (SIAP)



The fusion of disparate data links for a single integrated air picture is among technologies "on the verge of giving joint warfighting commanders significant new capabilities."

---Admiral Gehman USJFCOM discussing the Rosetta Link-16 / JVMF ACTD, AvWeek April 10, 2000

Attributes for a Single Integrated Air Picture (SIAP)

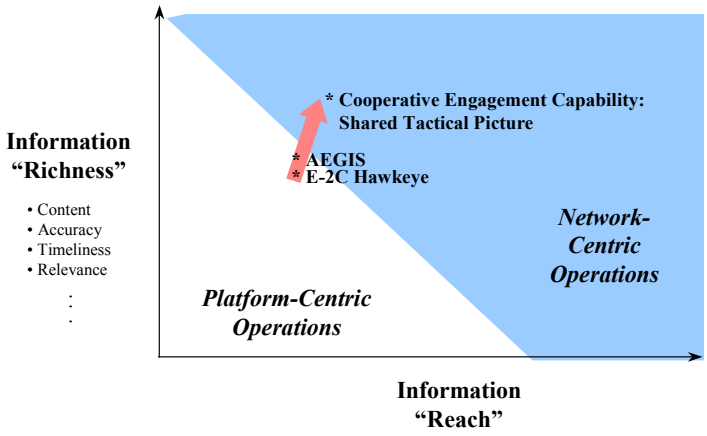
- Completeness. The percentage of real tracks that are included in the SIAP.
- Correctness. Data accurately reflects true track attributes (position, kinematics, and identity).
- Commonality. Track attributes of shared data are the same for each SIAP user.
- Continuity. Proper maintenance of track attributes over time.
- Timeliness. Data is where it is needed, when it is needed.

Source: Representative Measures of a Single Integrated Air Picture (SIAP)

Take Aways

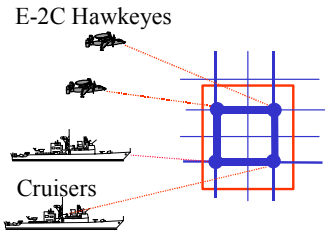
- **"Network Centric Warfare is the cornerstone of DoD's Transformation"**
  - ***DoD Report to Congress on NCW***
- **Network Centric Warfare is *real***
  - ***Evidence exists and is compelling***
  - ***Clear linkage between Information Advantage and Warfighting Advantage***
- **But ---- It's complicated**

Information Advantage: Theater Air and Missile Defense



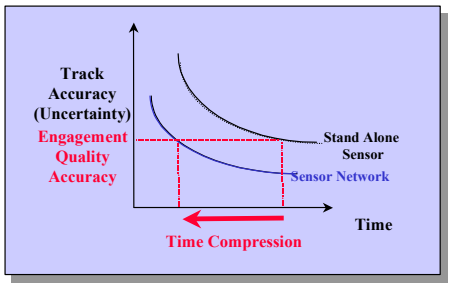
Information Advantage: Theater Air and Missile Defense

Cooperative Engagement Capability

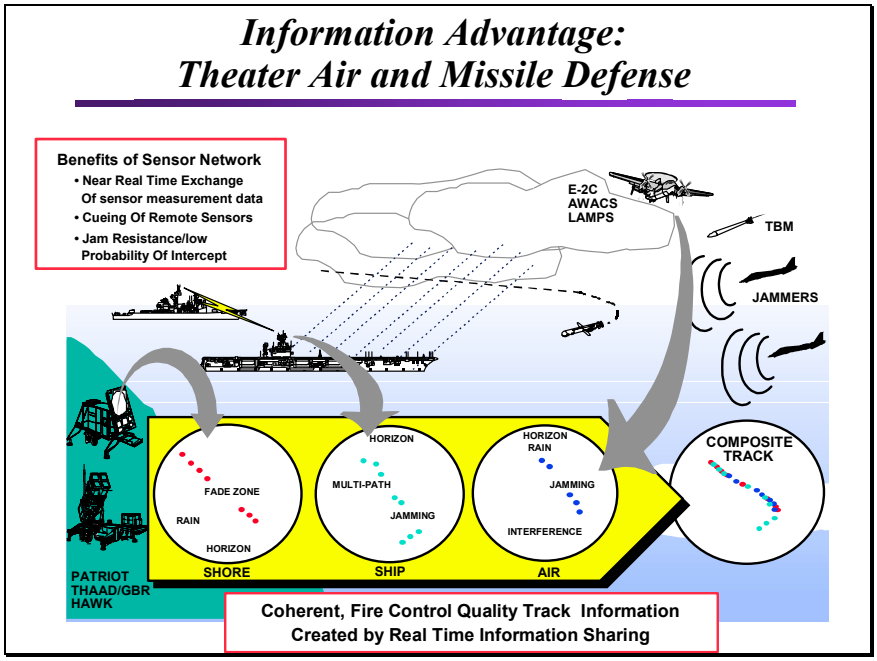


Sensor Data Fusion Decreases ***Time*** Required to Generate Engagement Quality Information

- Generates *engagement quality information* with reduced timelines
- Fuses multi-sensor data
- Quantum improvement in track accuracy, continuity, and target identification
- Extends detection ranges



Information Quality vs. Time



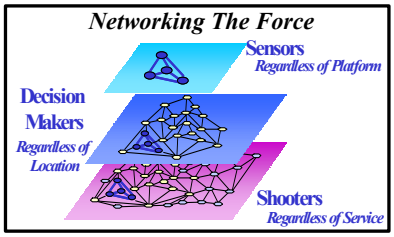
CEC is a revolutionary development—a high-speed data link that enables the sharing of fire-control quality tracking data from radars on dispersed platforms in near real time.

The benefits are twofold:

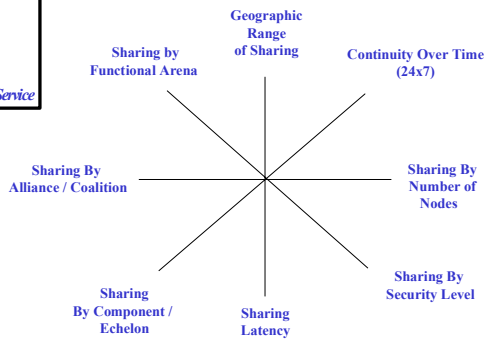
- The resulting composite track is more accurate and cleaner than the track from any individual sensor
- Even more dramatic, CEC enables a ship to shoot at targets it cannot see with its own sensors, based on tracking data from other platforms.

CEC is being deployed on Aegis ships and the E-2.

Measuring Information Advantage: Metrics for the Information Domain



Information Reach



Source: Understanding Information Age Warfare

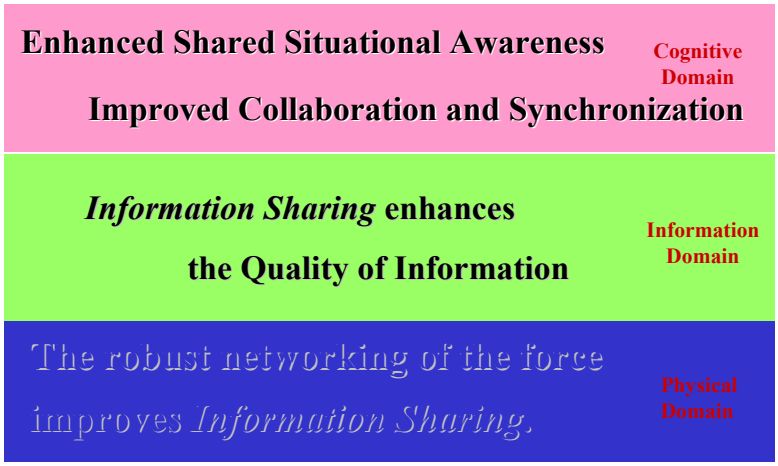
Network Centric Warfare

Information Sharing **enhances Shared Situational Awareness**	**Cognitive Domain**
Information Sharing **enhances the Quality of Information**	**Information Domain**
The robust networking of the force improves *Information Sharing.*	**Physical Domain**

Network Centric Warfare

- ***Cognitive Domain:***
  - **The force has the capability to develop and share high-quality situational awareness.**
  - **The force has the capability to develop a shared knowledge of commanders' intent.**
  - **The force has the capability to self-synchronize its operations.**

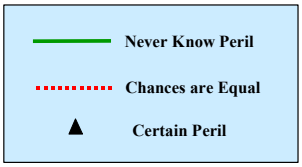
Network Centric Warfare

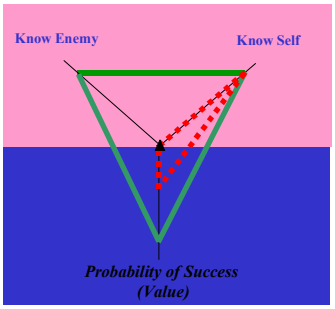


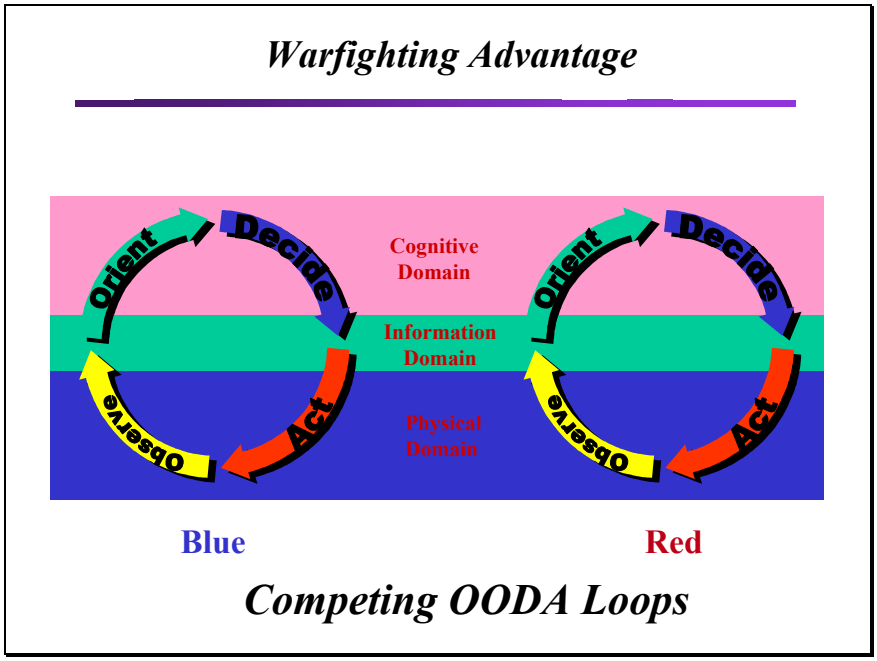
Measuring Warfighting Advantage

" Know the enemy and know yourself; in a hundred battles you will never know peril. When you are ignorant of the enemy but know yourself, your chances of winning or losing are equal. If ignorant of both your enemy and yourself, you are certain in every battle to be in peril."

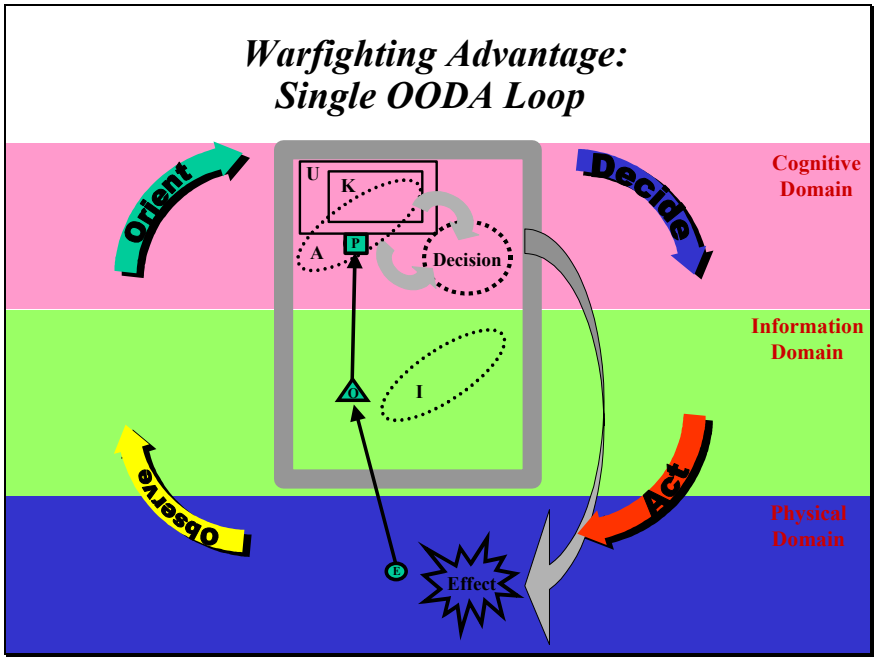
Sun Tzu

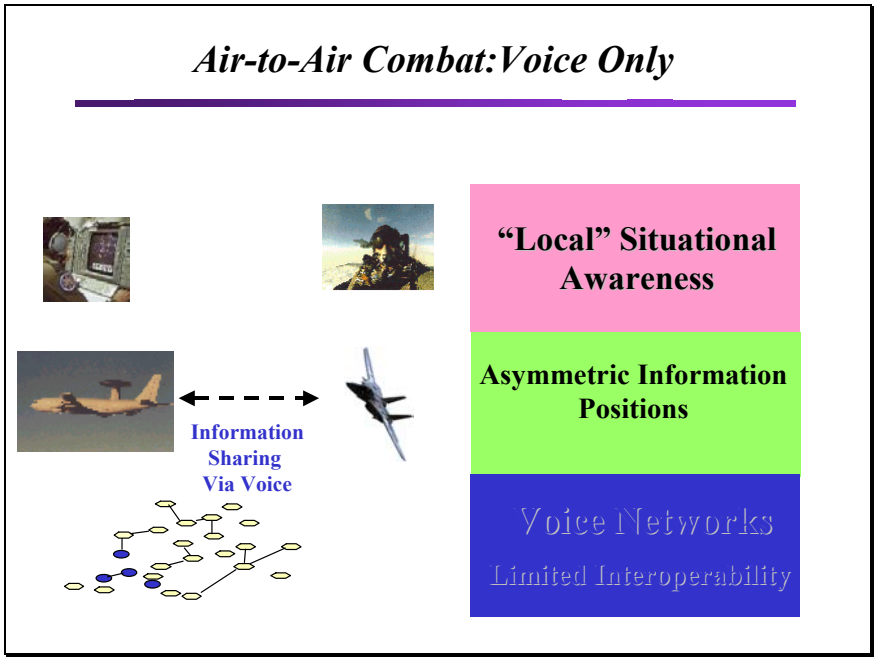






This is the familiar OODA loop. We considered the loop in the context of the CSOF mission and identified key events in the prosecution of a single SOF transport; these are the initial detection, the initial valid track, the nomination of a target for engagement, bombs on target, and the receipt of BDA.


Warfighting Advantage:
Single OODA Loop
Orient
Decide
Observe
Act
U
K
A
P
Decision
O
I
E
Effect
Cognitive Domain
Information Domain
Physical Domain


Air-to-Air Combat:Voice Only
Information Sharing Via Voice
"Local" Situational Awareness
Asymmetric Information Positions
Voice Networks
Limited Interoperability

Air-to-Air Combat: Voice Only

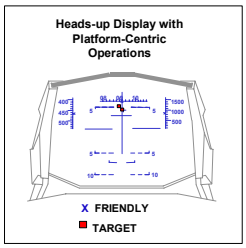
Physical Domain

Adversary Aircraft

Blue Aircraft's Organic Sensor

Blue Aircraft

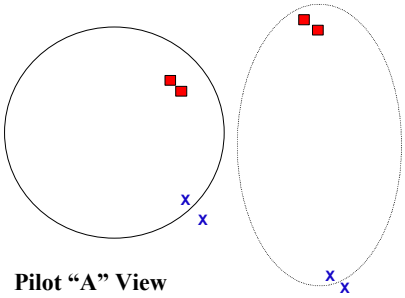
Information Domain



Warfighter View which results from sharing info via voice only communications

Air-to-Air Combat: Voice Only

Information Domain

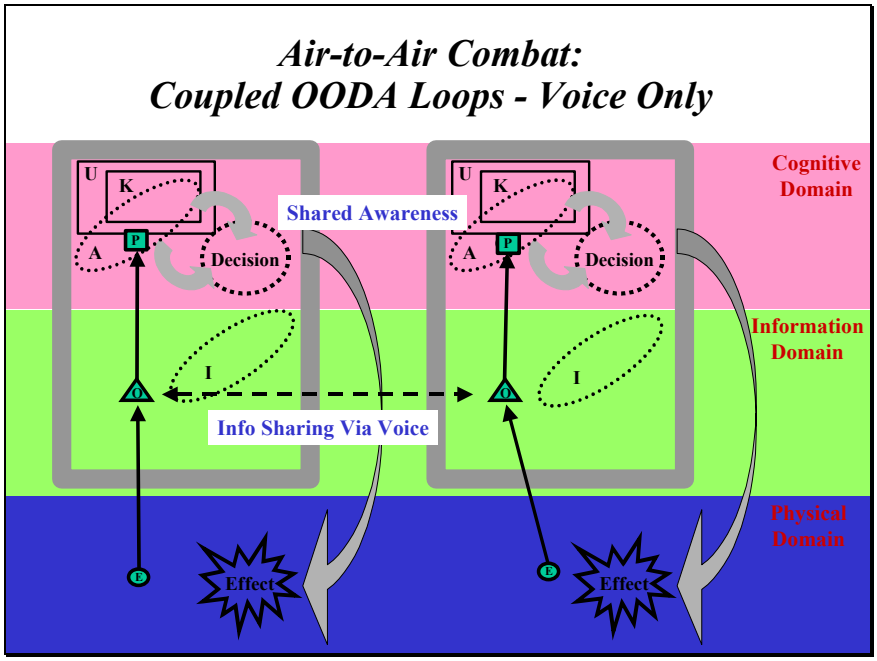


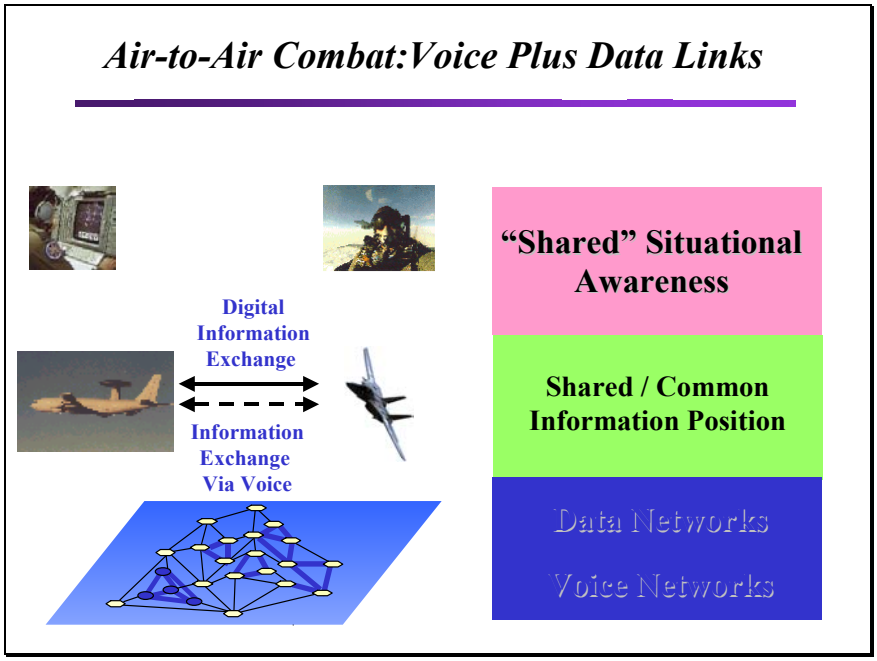
Pilot "A" View

Pilot "B" View

Warfighters Do not Share Common Information

Asymmetric Information Positions


Air-to-Air Combat:
Coupled OODA Loops - Voice Only
Cognitive Domain
Information Domain
Physical Domain
U
K
A
P
Decision
Shared Awareness
I
O
Info Sharing Via Voice
E
Effect


Air-to-Air Combat:Voice Plus Data Links
Digital Information Exchange
Information Exchange Via Voice
"Shared" Situational Awareness
Shared / Common Information Position
Data Networks
Voice Networks

Air-to-Air Combat:Voice Plus Data Links

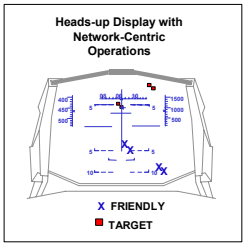
Physical Domain

Adversary Aircraft

Blue Aircraft's Organic Sensor

Blue Aircraft

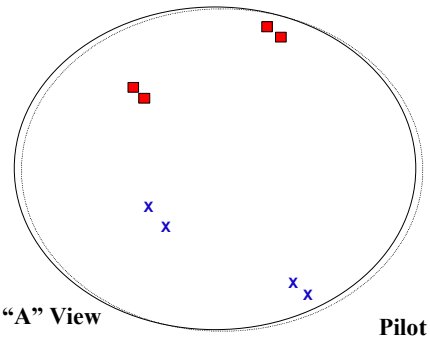
Information Domain



Warfighter View which results from sharing info via voice and data communications

Air-to-Air Combat: Voice Plus Data Links

Information Domain



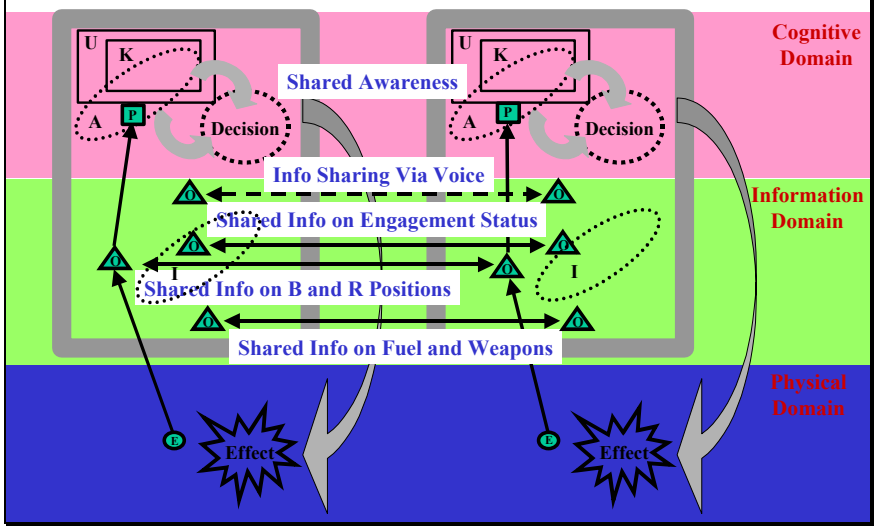
Warfighters Share Common Information

Symmetric Information Positions

Pilot "A" View

Pilot "B" View

Air-to-Air Combat: Coupled OODA Loops - Voice Plus Data Links



To Probe Further

- **DoD Report to Congress on Network Centric Warfare**
  - ***Online at www.dodccrp.org***
- **Books**
  - ***Blown to Bits*** by Evans and Wurster
  - ***The Innovators Dilemma*** by Clayton Christensen
  - ***Network Centric Warfare: Developing and Leveraging Information Superiority*** by Alberts, Garstka, and Stein, ***Online at www.dodccrp.org***
  - ***Understanding Information Age Warfare*** by Alberts, Garstka, Hayes and Signori, ***Online at www.dodccrp.org***
- **Brochures**
  - ***Information Superiority:*** www.c3i.osd.mil/infosup/
  - ***Global Information Grid:*** www.dtic.mil/jcs/J6

To Probe Further (Cont.)

- Articles
  - ***Proceedings of the Naval Institute***
    - ***"Network Centric Warfare: Its Origin and Future,"*** by VADM A.K. Cebrowski and John J. Garstka, Jan 1998
    - Multiple articles on topic of NCW in subsequent issues
  - ***Defense News***
    - ***"The Future Is Networked: U.S. Must Take Charge of New Military Revolution,"*** Senator Joseph Lieberman, 21 Aug 2000
  - ***PHALANX***
    - ***"Network Centric Warfare: An Overview of Emerging Theory,"*** John J. Garstka, Dec 2000
  - ***Business 2.0***
    - ***"America's Secret Weapon,"*** Tom Stewart, Dec 2001
      http://www.business2.com/articles/mag/0,1640,35142,FF.html

Historical Evidence for Warfighting Advantage: Creating New TT&P to Exploit Technology

Often new command and control concepts arise out of a desire to leverage new capability that provides increased information.

An illustration of this is the emergence of the concept of "Command by Negation" within the U.S. Navy. In June of 1972, the U.S. Navy introduced the F-14A into the Fleet as a replacement for the F-4 as its front line Fleet air defense fighter.

The F-14A had a number of significant performance advantages over the F-4, one of which was its ability to generate a superior level of onboard situational awareness.

This superior awareness was generated by AWG-9 radar, which provided the F-14A crew with an actual target video symbol, as opposed to raw radar returns provided by the AWG-10 radar deployed on F-4s.

This superior situational awareness remained unexploited for over 6 years, as the Fleet Air Defense Mission continued to use the same command and control doctrine employed with the F-4s.

This doctrine called for fighters to be directed to targets by controllers operating in E-2s and Ship Combat Information Centers with positive control enforced when available.

Historical Evidence for Warfighting Advantage: Creating New TT&P to Exploit Technology

The potential for F-14As to generate increased combat power became apparent in 1978 during exercise Beacon South.

During this exercise, Royal Australian Air Force pilots, employing aggressive maneuvers designed to make tracking difficult, were able to penetrate the battle group's air defenses with their F-111s.

During the exercise, U.S. Navy pilots flying F-14As had the F-111s in track, but were directed away from the F-111s by a ship-based CIC controller to what turned out to be nonexistent targets.

As a result of the lessons learned from this exercise, the command and control doctrine of "Vector Logic" was approved for use in the 7th Fleet.

The following year, the command and control doctrine of "Command by Negation" was approved for Fleet-wide use.

Finally, this doctrine provided F-14A crews with a rule set that enabled them to exploit their superior onboard situational awareness to engage targets at will unless otherwise directed by operational commanders.

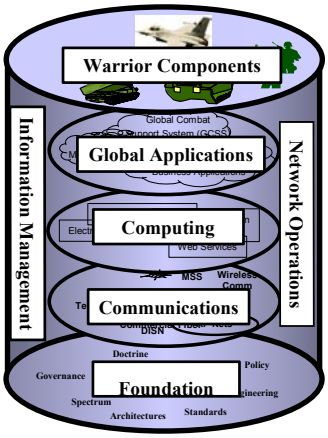
Source: Network Centric Warfare: Developing and Leveraging Information Superiority

Networking Improves Information Sharing

	Individual/ Node	**Unit/ Flight**	**Force**
Info On: **Blue Force**		Tactical C2 Systems *Info Sharing*	C2 Systems *Info Sharing*
Red Force	Organic Sensors *Info Sharing*	Tactical Sensors *Info Sharing*	ISR Sensors *Info Sharing*

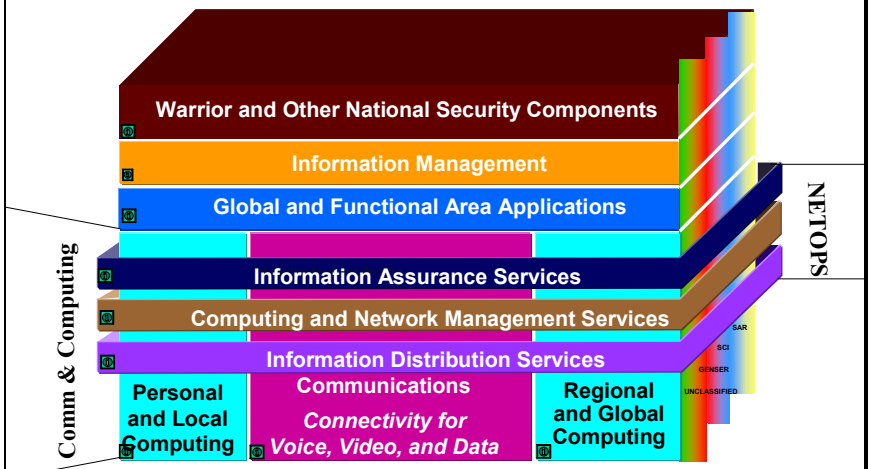
The Global Information Grid (GIG):
Entry Fee for Mature NCW

- **A single secure Grid providing Information Superiority for the DoD and Intelligence Community**
- **Seamless end-to-end capabilities**
- **Joint, high capacity netted operations**
- **Fused with weapons systems**
- **"Plug and Play" interoperability**
- **- Guaranteed for US and Allied**
- **- Connectivity for Coalition users**
- **Information/Bandwidth on demand**
- **Defense in Depth against all threats**

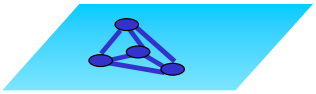


Protected, Assured, Interoperable Information

GIG Systems Reference Model:
How We Think IT Fits Together



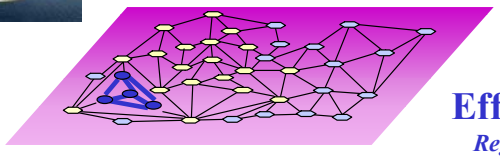
Networking The Force: Sensors



Sensors

Regardless of Platform

Networking the Force: Effecters



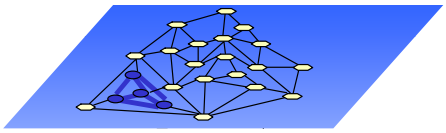
Effecters

Regardless of Service

Networking The Force: Decision Makers

Decision Makers

Regardless of Location



IV. Metrics for Transformation, Joel Resnick

Metrics for Transformation

Brief to IDA Cost Research Symposium

23 May 2002

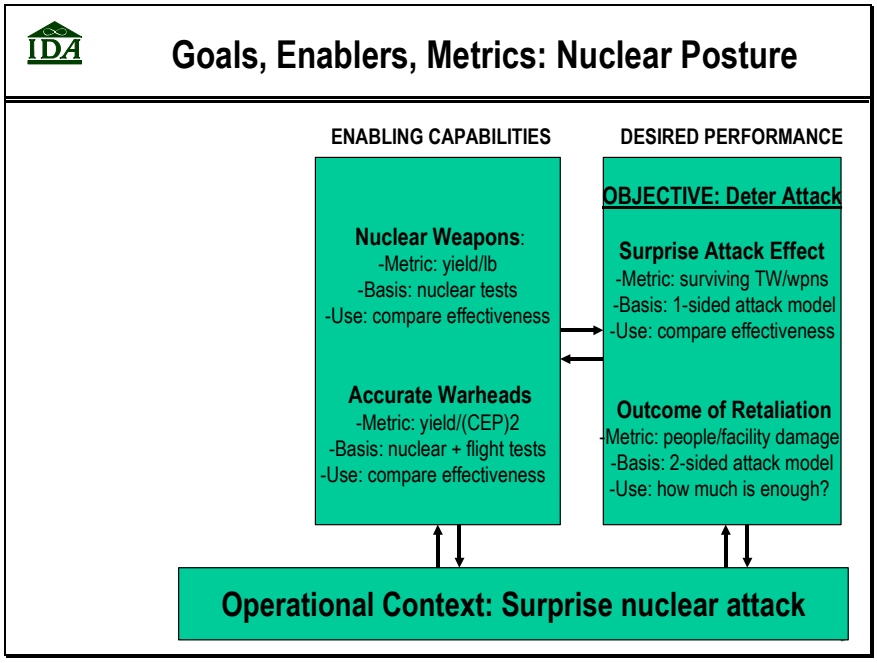
Joel Resnick

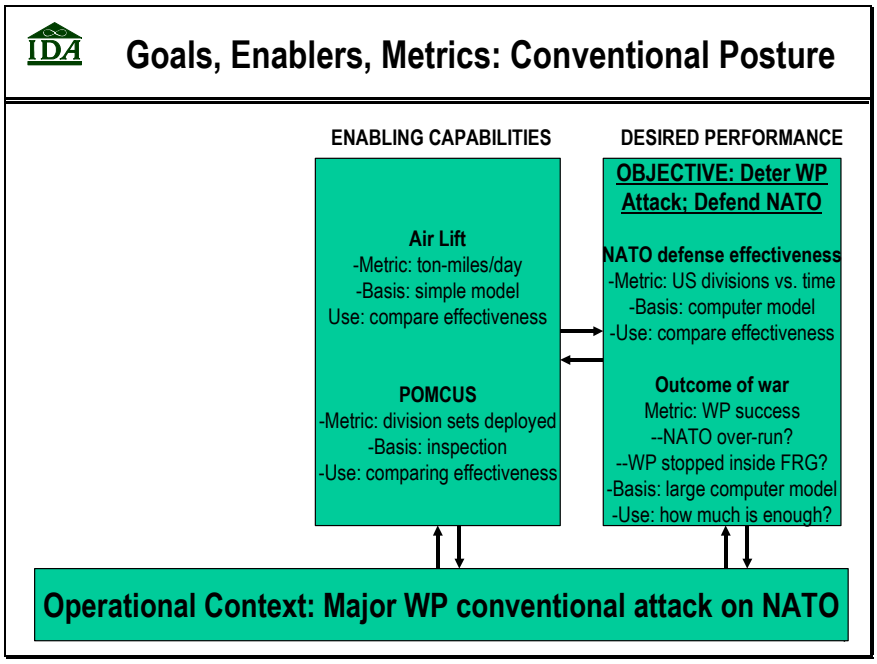
1

Overview to Study on Metrics for Transformation

- IDA-wide study to advance transformation
  - OSD sponsored (PA&E lead, with AT&L, Policy, and OFT)
  - Started early January '02
  - Input to mid April '02 DPG
- Task
  - Develop framework to think about transformation, QDR goals, metrics
  - Identify metrics for QDR's six operational goals
  - Apply them in exemplar cases
- Status of Results
  - Brief: Developing Metrics (3/24/02)
  - Brief: Using Metrics (4/8/02)
  - Brief: Guidance for Transformation & Metrics (4/12/02)

2


IDA
Goals, Enablers, Metrics: Nuclear Posture
ENABLING CAPABILITIES
DESIRED PERFORMANCE
Nuclear Weapons:
-Metric: yield/lb
-Basis: nuclear tests
-Use: compare effectiveness
Accurate Warheads
-Metric: yield/(CEP)2
-Basis: nuclear + flight tests
-Use: compare effectiveness
OBJECTIVE: Deter Attack
Surprise Attack Effect
-Metric: surviving TW/wpns
-Basis: 1-sided attack model
-Use: compare effectiveness
Outcome of Retaliation
-Metric: people/facility damage
-Basis: 2-sided attack model
-Use: how much is enough?
Operational Context: Surprise nuclear attack


IDA
Goals, Enablers, Metrics: Conventional Posture
ENABLING CAPABILITIES
DESIRED PERFORMANCE
Air Lift
-Metric: ton-miles/day
-Basis: simple model
Use: compare effectiveness
POMCUS
-Metric: division sets deployed
-Basis: inspection
-Use: comparing effectiveness
OBJECTIVE: Deter WP Attack; Defend NATO
NATO defense effectiveness
-Metric: US divisions vs. time
-Basis: computer model
-Use: compare effectiveness
Outcome of war
Metric: WP success
--NATO over-run?
--WP stopped inside FRG?
-Basis: large computer model
-Use: how much is enough?
Operational Context: Major WP conventional attack on NATO

Focus: QDR Report & Six Key Operational Goals

- **QDR Report (9/30/01) addresses transformation**
  - Not all change in capabilities (however desirable) is transformational
  - Purpose of transformation:
    - maintain or improve US military preeminence
    - in the face of potential disproportionate discontinuous changes in environment
- **Six goals focus for DoD's (immediate) transformation efforts**
  1. Protect bases of operation, home and abroad, and defeat threat of CBRNE weapons
  2. Assure information systems in the face of attack and conduct effective info ops
  3. Project and sustain US forces in distant anti-access and area-denial environments
  4. Deny enemies sanctuary by providing persistent surveillance, tracking, rapid engagement
  5. Enhance the capability and survivability of space systems
  6. Leverage info technology and innovative concepts to develop interoperable Joint C4ISR

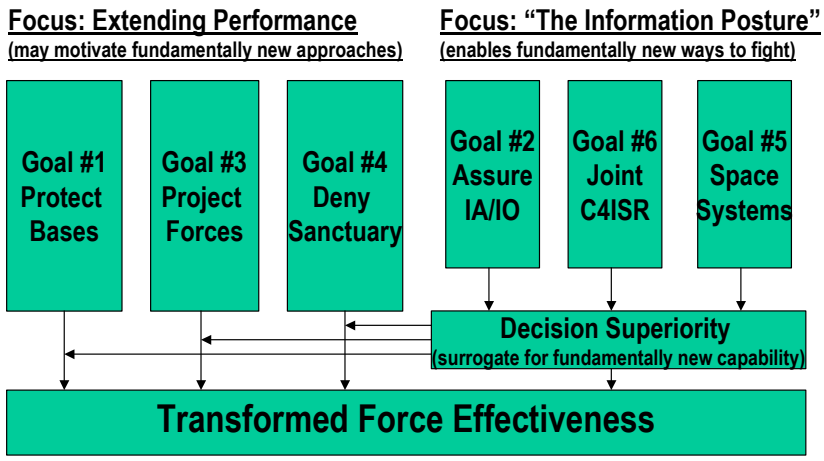
5

Two Basic Transformation Themes Implicit in QDR

- **Manage Risk & Uncertainty**
  - Extend what we sometimes do well into new domains
    - Protect bases, project forces, deny sanctuary
    - Important for capabilities-based force
  - Meet a "high bar" in doing it
    - Breadth and endurance in capability, strategic impact on Red
  - But, as long as it's cost-effective, shouldn't care how it's done
    - An old way can be as good as a new way
- **Do Things Fundamentally Differently**
  - "It's about T*R*A*N*S*F*O*R*M*A*T*I*O*N stupid!"
  - So we should care strongly that we change how things are done:
    - How we fight (e.g. new competitive space, new performance curve)
    - How we prepare to fight (e.g. new DoD processes, culture valuing innovation)

6

Contribution of Goals to Transformed Force



7

Who Says It's Transformational?

The Problem / The Solution	Managing Risk & Uncertainty: 6 QDR Goals	Managing Risk & Uncertainty: Other Goals
Fundamentally New Way		
Old Way (but Cost-Effective)		

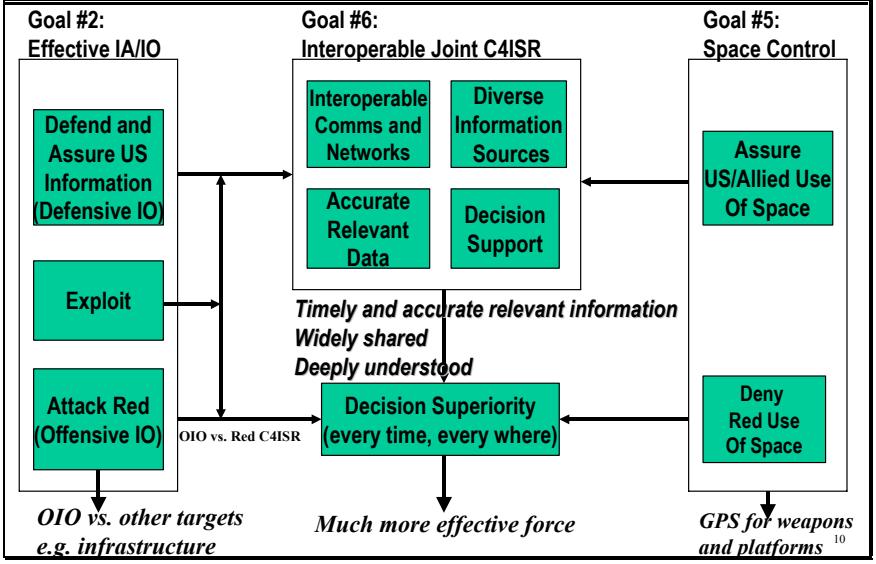
8

Who Says It's Transformational

The Problem / The Solution	Managing Risk & Uncertainty: 6 QDR Goals	Managing Risk & Uncertainty: Other Goals
Fundamentally New Way	**ALL**	**OFT Services CJCS**
Old Way (but Cost-Effective)	**QDR Services CJCS?**	**Services, if: --expensive --high tech**

9

Contributions of Goals to Decision Superiority



10

Performance Attributes & Metrics for C4ISR

- **Timeliness & Accuracy of Relevant Information**
  - Timeliness -- latency of information + speed of decision making
  - Accuracy -- completeness + correctness
- **Extent of Sharing**
  - Horizontal as well as vertical reach within the organization
  - Across organizational boundaries (Service lines, interagency, coalition)
  - Sensors, users, weapons
  - Across time-zones and geography
- **Depth of Understanding**
  - People – quality and quantity of education and exercises
  - Decision tools – availability/sophistication of tools to turn data into understanding
  - Procedures – planning for discourses to share mental-models and judgments
  - Performance demonstrated -- tests, exercises, ACTDs, contingencies

11

Decision Superiority: Much More Effective Force

- **Enable operational concepts effective for specific QDR goals**
  - Urban ops with less casualties/collateral, by emphasizing Understand and Shape
  - Attack of mobile targets emphasizing rapid sense-and-attack ops
  - Rapid decisive joint operations using decision superiority as "armor"
- **Enable new ways to fight in a range of future joint operations**
  - Self-synchronized operations
  - Operational-level effects based operations
    - focused on adaptation to effects of actions, rather than target attrition
  - Operations with much less idle force:
    - more target information in a target poor environment
    - faster decision making vs time-sensitive targets
    - reduced operational uncertainty, to reduce need for uncommitted reserves

12

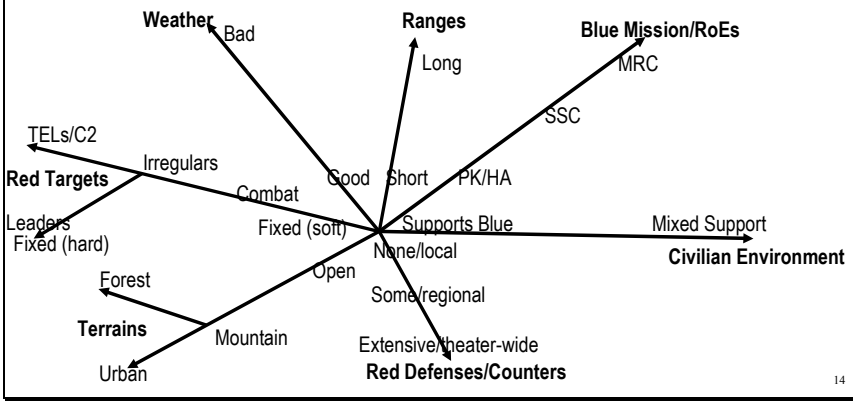
Approach to Extending Performance: Goals #1, 3, 4

- **Describe the goal (in a transformational sense)**
  - **Visualize breadth and robustness**
    - **multi-dimensional spider chart in most cases**
  - **Focus on high-risk difficult operational problems**
- **Identify key enabling capabilities in new operational concepts**
- **Develop associated metrics**
- **Explore use of key enablers and metrics**

13

Goal #4. Deny Enemies Sanctuary

Deny enemies sanctuary by providing persistent surveillance, tracking and rapid engagement with high-volume precision strike, through a combination of complementary air and ground capabilities, against critical mobile and fixed targets at various ranges and in all weather and terrains.



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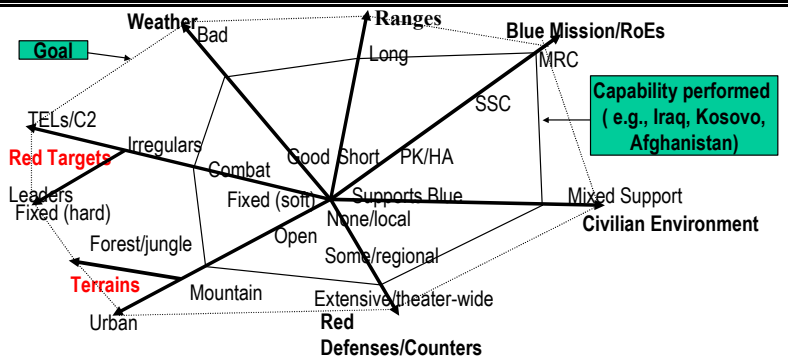
Goal #4. Breadth of Operational Problem



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Goal #4. Examples of Operational Problems Based on Terrain & Red Target

Terrain \ Target	Leaders	TELs/C2	Irregulars	Combat Forces	Fixed Facilities
Urban					
Forest, Jungle					
Caves, Tunnels					
Mountain					
Open, Desert					

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Goal #4: New Ops Concepts, Key Enablers, Metrics

New US operational concepts emphasizing "understand, shape, track", eg

- In urban areas, achieve objectives with low casualty rates and collateral damage
- In forest/jungle areas, achieve objectives quickly

1. Understand environment and localize Red, Blue, Others

- Quality of cueing for different targets (time delay, confidence, location uncertainty)
  - » based on intelligence, launch detection, SIGINT, HUMINT over-watch, staring sensors

2. Shape environment and control Red

- Delay in Red commanders situation awareness and communication to units/HQs
  - » based on use of offensive IO, anti-mobility barrier

3. Comprehensively track and ID targets

- Duration and accuracy of tracking and identification
  - » based on new sensors, distributed netted sensors

4. Effectively engage targets

- Effectiveness of weapons with "special" capabilities (effective in these terrains)
  - » based on simulations, tests, real contingencies

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Picking Specific Programs?

- **Enablers and metrics developed focused on transformation**
  - Identify how programs support one of the six goals
  - Not intended to capture desirable changes not transformational
- **Don't capture factors important in picking specific programs**
  - Costs -- development, acquisition
  - Risks -- technological, environmental
  - Other impacts -- personnel, infrastructure, Congressional

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Analysis of an Investment Strategy

- **Portfolio Analysis**
  - Given -- portfolio of programs (e.g., acquisitions, DARPA programs, ACTDs, JEs)
  - Issue – how well does it cover QDR goals
  - Approach -- map programs to all goals covered (used 97 ACTDs from '95 – '02)
- **Individual Goal Analysis**
  - Given – programs tied to a goal
  - Issues
    - Coverage of enablers
    - Adequacy of coverage
  - Approach
    - Map programs to enablers (used ACTDs)
    - Use metrics to evaluate impact on enablers

} Metric analysis identified the key enablers

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Observations Based on Mapping ACTDs

- **High focus (45 of 97 ACTDs) on Goal #6 (Joint Interoperable C4ISR) and Goal #1 (Protecting Bases/Defeating CBRNE)**
  - Long-term interest in DoD on these goals
  - Do these ACTDs lay the basis for big improvements in coming years?
- **Low focus (13 of 97) on Goal #2 (IO/IA) and Goal #5 (Space)**
  - Space expensive to do and AF + NRO fund similar programs
  - IO/IA probably ripe for more attention but may not be well matched to ACTDs
- **Other observations**
  - 12 of 97 ACTDs associated with more than one goal
  - Only minor differences in focus in '95-'98 vs '99-'02
  - 22 ACTDs (23% of total) not strongly tied to any goal
    - What's appropriate % in coming years?

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ACTDs Mapped to Enablers for Goal #4

	Open, Desert	Forest	Urban	Caves & Tunnels
Understand and Shape			ADS, MOUT (shape)	
Comprehensive Tracking & ID	HYCAS, SBMTI, UAV, MAV, GAPS, PTI, UGS	MAV		
Effective Engagement	ATL, LEWK (Vehicles)		ADS	TACMS-P (Vehicles) Thermobarics (People)

- ***Focus has been on open terrain***
- ***Gaps exist for more difficult environments***

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Comments: Analyzing Existing Investment Strategy

- **Key enablers and metrics useful for identifying:**
  - **Gaps in coverage**
  - **Trends over time**
  - **Appropriate future emphasis**
- **Limitations**
  - **Gaps in one "portfolio" could be addressed in another "portfolio"**
  - **Lack of gaps doesn't mean that all issues being addressed**
- **Really need all the investments for each goal**
  - **All technology programs (ACTDs, RDT&E, DARPA programs)**
  - **All experimentation (Joint, Service, CINC, Defense Agencies)**
  - **All acquisitions**
- **These would be worth analyzing in detail**

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Transformation-Driven Guidance

Cold War: Services faced Soviet-threat driven performance standards

- --Surviving missile throw-weight and RVs
- --Air lift in mton-miles/day
- --Army forces available in Europe -- ten divisions in ten days

Post Cold War: Services faced new threats and performance standards, e.g.

- --New threats – MTWs, SSCs, PK/HA
- --New technology -- precision munitions, UAVs, stealth aircraft
- --New missions -- aerial denial over Iraq

Today: QDR goals do not yet provide same specific performance standards

- --Little in the way of specific new missions or procurements
- --New joint operational concepts are still largely conceptual
- --Still working at defining strategy-driven capabilities-based requirements

But useful guidance still possible today

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Could Call for Needed "Infrastructure"

1. Define Where We Are Today. Director (PA&E) will define for the Department the current existing "investment portfolio" for each goal, and use it as an aid to investment decisions. The portfolio will include all current technology programs (ACTDs, DARPA, other RDT&E), all experimentation (Joint, Service, CINC, Defense Agency), and current acquisitions critical to achieving each goal.

2. Appoint Advocates. Director (Force Transformation), Director(PA&E), and Director (Joint Staff) will each identify assistants to be advocates for each goal, e.g., when reviewing the investment portfolio for that goal or new models and simulations.

3. Provide Analytical Continuity and Focus. Director (Force Transformation) will arrange for an organization (e.g., Service Battle Lab, FFRDC, contractor) to give relentless analysis to the QDR goals and the opportunities for synergy among them, and to capture and share what is learned by DoD and US allies about them.

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Overview to Study on Metrics for Transformation

- IDA-wide study to advance transformation
  - OSD sponsored (PA&E lead, with AT&L, Policy, and OFT)
  - Started early January '02
  - Input to mid April '02 DPG
- Task
  - Develop framework to think about transformation, QDR goals, metrics
  - Identify metrics for QDR's six operational goals
  - Apply them in exemplar cases
- Status of Results
  - Brief: Developing Metrics (3/24/02)
  - Brief: Using Metrics (4/8/02)
  - Brief: Guidance for Transformation & Metrics (4/12/02)

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Backups

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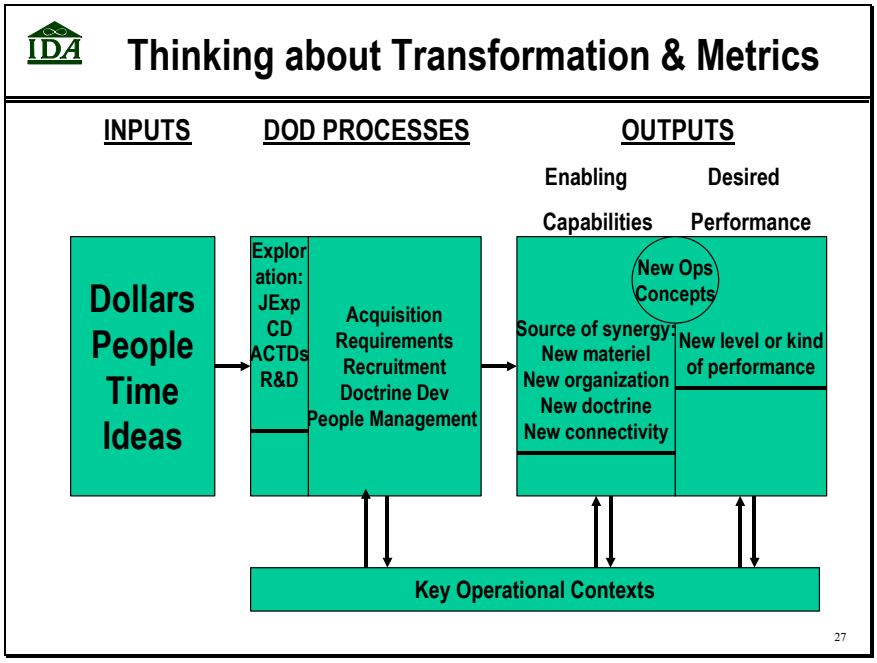
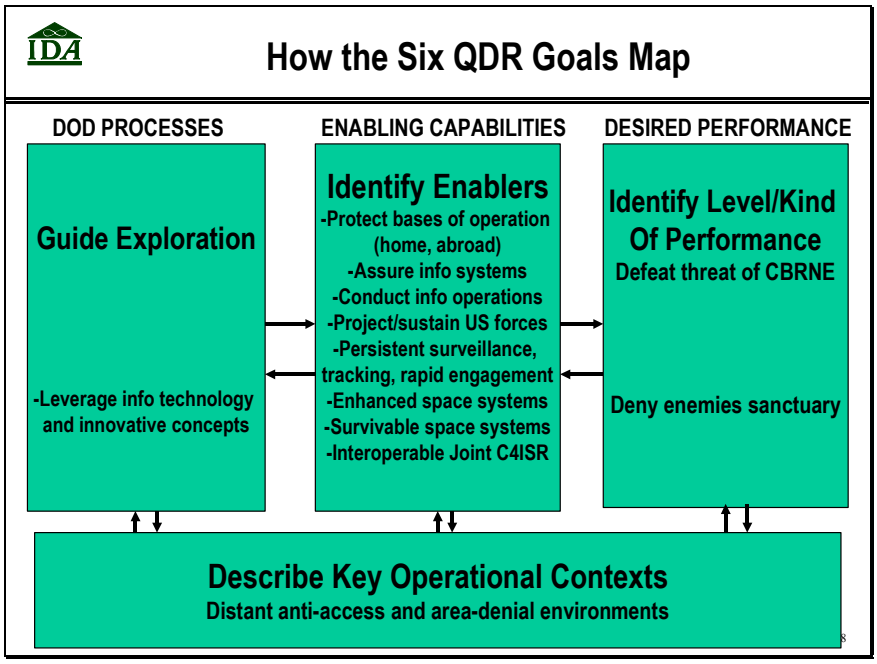
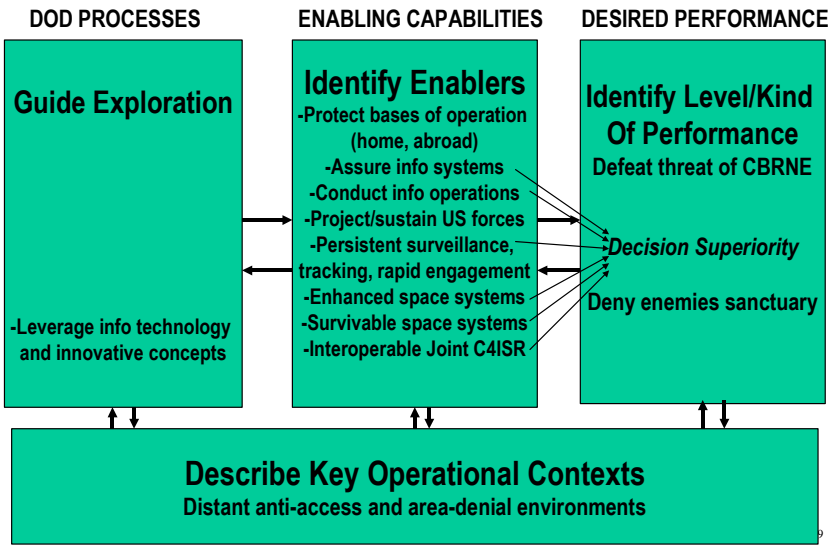

Thinking about Transformation & Metrics
INPUTS
DOD PROCESSES
OUTPUTS
Enabling Capabilities
Desired Performance
Dollars People Time Ideas
Exploration: JExp CD ACTDs R&D
Acquisition Requirements Recruitment Doctrine Dev People Management
New Ops Concepts
Source of synergy: New materiel New organization New doctrine New connectivity
New level or kind of performance
Key Operational Contexts
27


How the Six QDR Goals Map
DOD PROCESSES
ENABLING CAPABILITIES
DESIRED PERFORMANCE
Guide Exploration
-Leverage info technology and innovative concepts
Identify Enablers
-Protect bases of operation (home, abroad)
-Assure info systems
-Conduct info operations
-Project/sustain US forces
-Persistent surveillance, tracking, rapid engagement
-Enhanced space systems
-Survivable space systems
-Interoperable Joint C4ISR
Identify Level/Kind Of Performance
Defeat threat of CBRNE
Deny enemies sanctuary
Describe Key Operational Contexts
Distant anti-access and area-denial environments

QDR Goals Support Decision Superiority



Several Ways to Approach the Six Goals

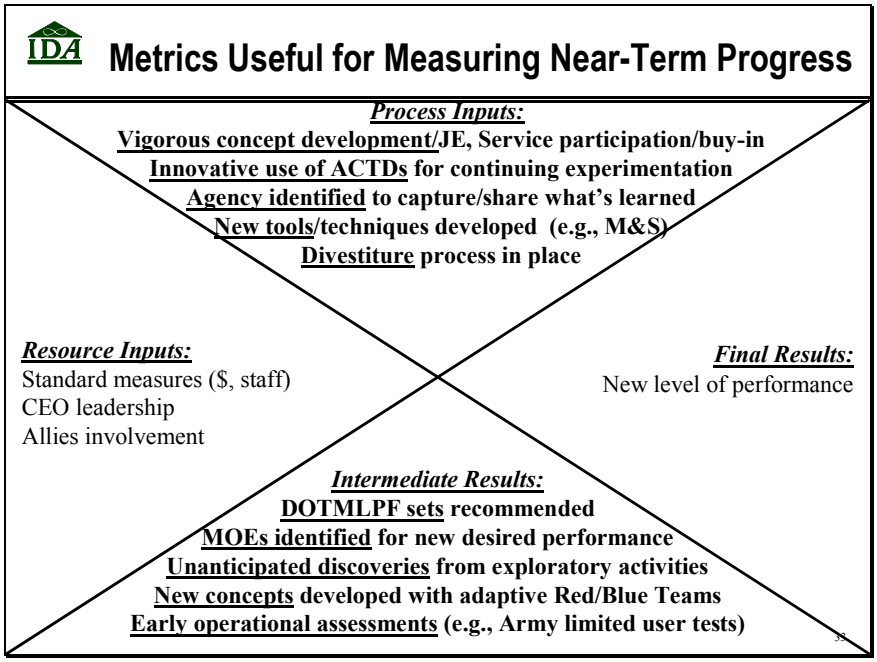
- Tie goals to one transformation objective
  - QDR did not offer one
  - We couldn't invent one
- Look at goals as a collection of enabling capabilities
  - Like aerial refueling in '30s, satellites in '50s
  - But this loses the coherence that some goals have
- Look at goals as separate independent objectives
  - Some goals identify desired performance or new contexts
  - But others focus on "information"
- Identify common transformational themes for the goals

Examples of ACTDs Not Tied to QDR Goals

- **FY02: Language & Speech Exploitation Resources (LASER)**
  - Automation of translation of spoken or written foreign languages
- **FY01: Personnel Recovery Extraction Survivability/Smart-Sensors**
  - Real time automated precision evader location, tracking and re-supply devices
- **FY00: Quick Bolt (QBolt) --** Integrating 5 guidance technologies into HARM
- **FY99: Joint Medical Operations – Telemedicine (JMO-T)**
  - Integrate Services deployable theater medical tele-presence
- **FY98: Line-of-Sight Anti-Tank System (LOSAT)**
  - System lethality vs tanks, deployability/mobility, military utility
- **FY97: Joint Advanced Health & Usage Monitoring System (JAHUMS)**
  - On-board sensors and diagnostics to monitor individual helicopter health/use
- **FY96: Combat Vehicle Survivability (CVS) --**Technology for Abrams tank
- **FY 95: Low-Life-Cycle Cost Medium-Lift Helicopter (LLC Helo) --** COTS

Measuring Near-Term Progress: The Problem

- **Standard resource measures (inputs) of limited value**
  - Inputs tell nothing about how effectively they're used
  - Still, levels and trends can identify emphasis
- **Performance measures (outputs) always preferred**
  - But new performance is a long way off
  - Even major program and organizational changes are a way off
    - These could be measured with program milestones
- **Need other measures as a check list for progress on each goal, e.g.**
  - New processes that are inputs to, and supportive of, transformational activities
  - Intermediate results, that will lead to major program/organizational changes



This page and the next discuss the kinds of metrics that can be developed at this stage for the inputs, the process, the intermediate results, and the new, fielded capabilities. In each case, a few examples are provided to illustrate the opportunities—and the problems—for metrics intended for the CEO's use. And since they're for the CEO, we're not looking for a large number of them.

Evaluate the Inputs—Hard & Harder

Metrics that enumerate resources and compare them to a yardstick need to focus on inputs that are clearly related to transformation. One could be the money for joint concept development and experimentation. Another could be the money for S&T programs supporting key enablers for transformation (e.g. an information utility). Another could be the changes in the personnel system to recruit, train, and retain the people with the key skills (e.g., information technology) that will be needed for the reshaped force.

Developing useful metrics for the commitment of DoD's "CEOs" (SecDef and CJCS) raises some sensitive issues. These should be planned for use by the CEOs as a self-check, rather than an external report card. In this case, metrics can be created permitting them to assess if the extent of their involvement and personal leadership meet their own personal commitment.

Types of Guidance on Transformation & Metrics

1. Transformation-Driven Standards to Meet
2. Steps to Greater Specificity
3. Infrastructure to Put in Place
4. Current Portfolios to Manage
5. Specific Gaps to Plug
6. Innovative Activities to Encourage

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V. Role of Cost Analysts in the New Defense Environment, Gary Bliss

IDA CRS

The Role of Cost Analysts in the New Defense Environment

Gary Bliss
Director, Weapon Systems Cost Analysis Division
OD/PA&E

Institute for Defense Analysis Cost Research Symposium

May 23, 2002

Budgeting to CAIG Estimate

IDA CRS

- **Budgetary instructions to Services states:**
  "In order to achieve program stability and avoid cost stretch-out, [the Services shall] properly price programs at not less than levels estimated by the Cost Analysis Improvement Group"
- **New guidance has a few "execution" issues:**
  - **CAIG has been staffed and organized *primarily* to perform episodic reviews at milestones (and fit in other duties)**
  - **Continuous maintenance of program estimates generally *not* done**
    - **Thus, demand by Services for current CAIG POM numbers often problematic**
  - **Demand for acquisition milestone reviews continues unabated**
- **Final resolution not clear**
  - **In the short run, CAIG is doing the best it can to provide numbers**
  - **Expansion of CAIG staff is a possibility**

Combined Budget/Program Review

IDA CRS

- Combination of two processes *is* the baseline
- Major features of the process remain unresolved
  - Details of the decision-making calendar and specific points of responsibility remain ambiguous
  - Detailed proposals implementing the new system now being staffed
  - Major thrust: ensure that the budget that results reflects the Administration's transformation priorities
- More concrete guidance on the process should be forthcoming shortly

Things Community Can Count On

IDA CRS

- Costs in Service POMs will be scrutinized
  - OSD CAIG's "Realistic Costing Issues" will be updated
- Major Issue papers/studies will be developed
  - Likely candidates include topics that derive from Spring/Summer's Front End Assessments (FEAs)
  - In addition, other topics related to Transformation-related issues are likely
  - Grouping of issues may be made in unfamiliar ways
- Decision-making calendar is likely to stack up many key matters towards the end of the process
  - Holiday period could easily become one in which numerous alternatives need to be addressed

Nunn-McCurdy

IDA CRS

- Administration believes restoring "credibility" of cost estimates a key goal
  - Nunn-McCurdy certification issues, thus, take on new significance
- CAIG now conducting intensive 6-8 week estimate updates
  - Extensive contact with PM staff and contractor visits
- Nunn-McCurdy Programs have, by definition, poor estimates
  - First question is: "What caused growth?"
  - Particular emphasis is being placed on identifying *where* and *why* estimates failed; what issues did we fail to address?
  - Objective is to improve cost methods/cost reporting

Evolving Role of Cost Estimators

IDA CRS

- Nunn-McCurdy work bringing a somewhat new role for cost estimators: Management Consultant
- CAIG is also providing extensive "back door" feedback to both contractors and PM chain on
  - How performance compares to industry standards
  - Specific opportunities for improvement and reduced costs
  - Specific individuals elsewhere in industry to benchmark
- Essence of this work is the establishment of unambiguous quantitative metrics
  - Conveniently, many useful metrics are often *precisely* those we use for cost estimating (e.g., hours/drawing)
  - Being able to say, for example, industry's best firms are able to achieve X annual inventory turns is immensely useful
  - Interest in this type of advice in both the private and public sector management chain is intense

VI. OSD Perspective, Russell Vogel

Costing the Transformation: The OSD CAIG Perspective

Russ Vogel
OSD CAIG Executive Secretary
May 23, 2002

Outline

- **What is the transformation?**
- **Transformation initiatives**
- **CAIG activities and research projects**
- **Transformation vision**

What is Transformation*?

Purpose: Keep the Armed Forces superior to any other nation's - today and tomorrow

Method: Maintain our quality force and transform it to meet challenges of the 21st Century

Endstate: An agile, knowledgeable, and decision-superior force

"Our primary purpose is to win our nation's wars - hone the warrior ethos"

***CJCS Strategic Plan, 5 December 2001**

Transformation Initiatives*

- **Goal: to improve linkage between strategy and investments**
- **Approach: focus DoD investment resources on four operational goals**
  - Dominate land, sea, air, and space battlespace
  - Achieving information and decision superiority
  - Deploying and sustaining military power rapidly
  - Strike with precision

*2001 Quadrennial Defense Review, pages 41-46.

Transformation Initiatives

1. Dominate land, sea, air, and space battlespace
   - Homeland defense: DoD must be prepared to support local and state authorities
   - Increasing investment in personal chemical/biological/nuclear protection
   - Selected readiness enhancements for Army Reserve
   - Develop missile defenses
   - Ensure freedom of movement in space
   - Protect space assets from asymmetrical attack

Transformation Initiatives

1. Dominate land, sea, air, and space battlespace

CAIG Activities

- **Ballistic Missile Defense Programs**
- **Space programs**
  - **Advanced Wideband/Mobile User Objective System**
  - **Space Based Radar**
  - **National Polar-Orbiting Operational Environmental Satellite System**

CAIG Studies

- **Improved CERs for BMD Systems**
- **SW Metric & Cost Growth Driver**

Transformation Initiatives

2. Achieving information and decision superiority
   - DoD must be able to rapidly collect, process, disseminate, and protect information
   - Perform computer network defense and attack missions
   - DoD requires high-capacity, interoperable communications systems that can transmit over secure, jam-resistant datalinks
   - Overcome projected bandwidth constraints
   - System architectures must be designed to incorporate interoperability

Transformation Initiatives

2. Achieving information and decision superiority

CAIG Activities

- **Global Combat Support System,**
- **Cooperative Engagement Capability**
- **Advanced Wideband System**
- **High Performance Computing Modernization**
- **Joint Tactical Radio System**

CAIG Studies

- **Improved Methodologies for Estimating Development Costs**
- **Cost Behavior of C4I Systems**
- **SW Metric & Cost Growth Driver**

Transformation Initiatives

3. Deploying and sustaining military power rapidly

- DoD must be able to project power worldwide
- Deliver appropriate firepower to locations where infrastructure is lacking or has collapsed
- Mask movements as much as possible
- Accelerate development of Army Objective Force

Transformation Initiatives

3. Deploying and sustaining military power rapidly

CAIG Activities

- **SSGN Conversion**
- **C-130AMP**
- **Force XXI Battle Command Brigade and Below Program**

CAIG Studies

- **Systems Engineering and Integration Costs for Navy Combat Systems**
- **Force and Support Cost System**
- **VAMOSC Metrics Study**
- **SW Metric & Cost Growth Driver**

Transformation Initiatives

4. Strike with precision
   - DoD must be able to find and strike enemy forces while limiting collateral damage (e.g., precision strikes)
   - Increased emphasis on intelligence, surveillance, and reconnaissance initiatives
   - Manned and unmanned long-range assets

Transformation Initiatives

4. Strike with precision

CAIG Activities

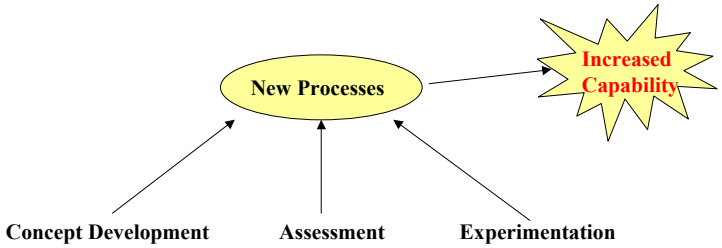
- **Global Hawk**
- **Joint Air Surface Standoff Missile**
- **Small Diameter Bomb**

CAIG Studies

- **Cost Behavior of C4I Systems,**
- **Cost Growth Database Website,**
- **Next Generation of UAV/UCAV Cost Estimating**
- **SW Metric & Cost Growth Driver**

Transformation: The Vision

Transformation is not an endstate….it's a process



If you don't know where you're going, any road will take you there

VII. Navy Perspective, Leonard Cheshire

My presentation will cover estimating the cost of the transformation in the Navy. The assessments, cost information, and studies associated with this subject represent the collective position of the various cost-estimating organizations within the Navy.

Outline

- Meaning of Transformation to the Navy
- Areas of Transformation
- Capabilities to Estimate Costs
- Summary and Conclusions

2

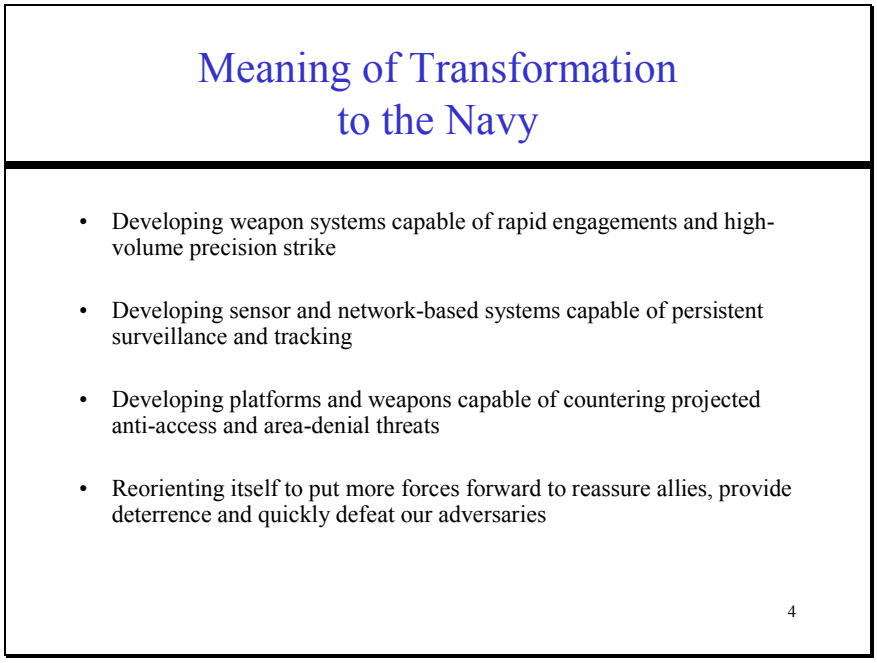
My approach for this presentation is to define what transformation means to the Navy, discuss several different areas within the transformation, define representative weapons systems relevant to each area, assess the Navy's ability to perform cost estimates of the transformation, and, finally, summarize and draw some conclusions.

Contributing Organizations

- Naval Center for Cost Analysis (NCCA)
- Naval Air Systems Command (NAVAIR 4.2)
- Naval Sea Systems Command (NAVSEA 017)
- Naval Surface Warfare Center, Carderock Division (NSWCCD)
- Naval Surface Warfare Center, Dahlgren Division (NSWCDD)
- Office of Naval Research (ONR)
- Air Force Cost Analysis Agency (AFCAA)
- OSD Cost Analysis Improvement Group (CAIG)
- RAND Corporation

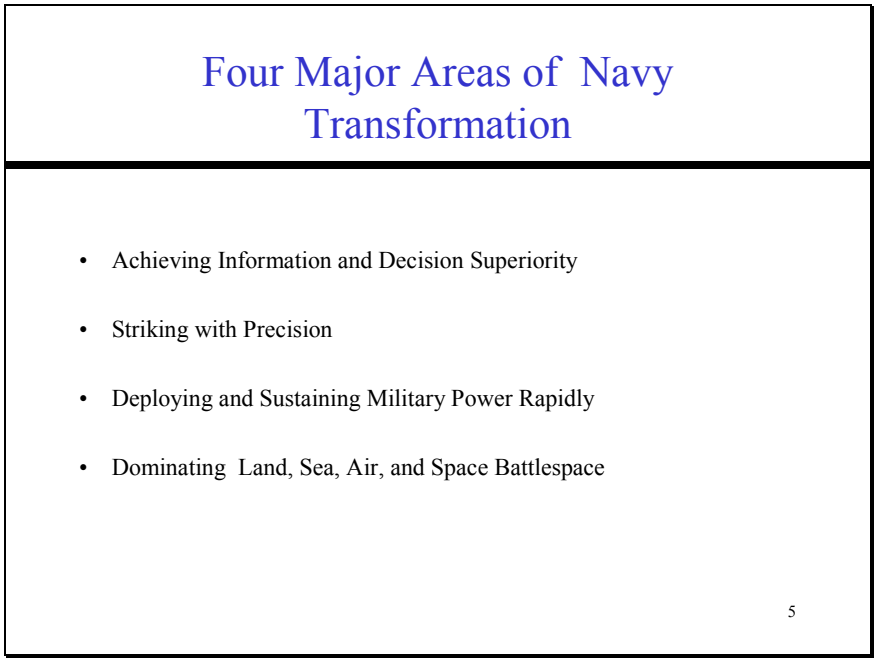
3

The organizations shown on this slide submitted cost research summaries that are relevant to the topic of Navy transformation. Studies from each of these organizations are referenced in this presentation. Note that they are not all Navy organizations.



The fundamental purpose of transformation is to move from superiority over a Cold War opponent to dominance across the full spectrum of twenty-first century military operations. Full spectrum dominance is to be achieved through Joint Response Forces (i.e., there will be a significantly enhanced operational capability by building a true joint integrated force capability). This will be accomplished by first transforming early entry forces using proven transformational technologies and concepts, and then building on forward-deployed capabilities through stationed and rotating deployments.

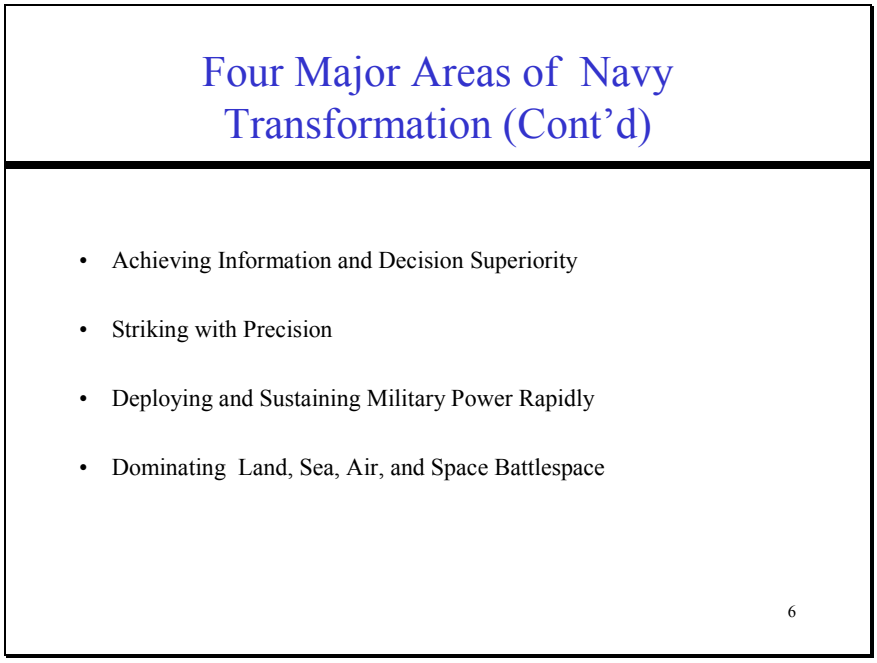
This slide addresses in a broad sense the implication of transformation to the Navy: rapid engagements and precision strike; persistent surveillance; countering access-denial threats by the enemy; and providing deterrence.



The capabilities of the previously mentioned Joint Response Forces encompass four general war-fighting capabilities, or areas, as depicted on this slide. This presentation will address these areas of transformation from the following perspectives.

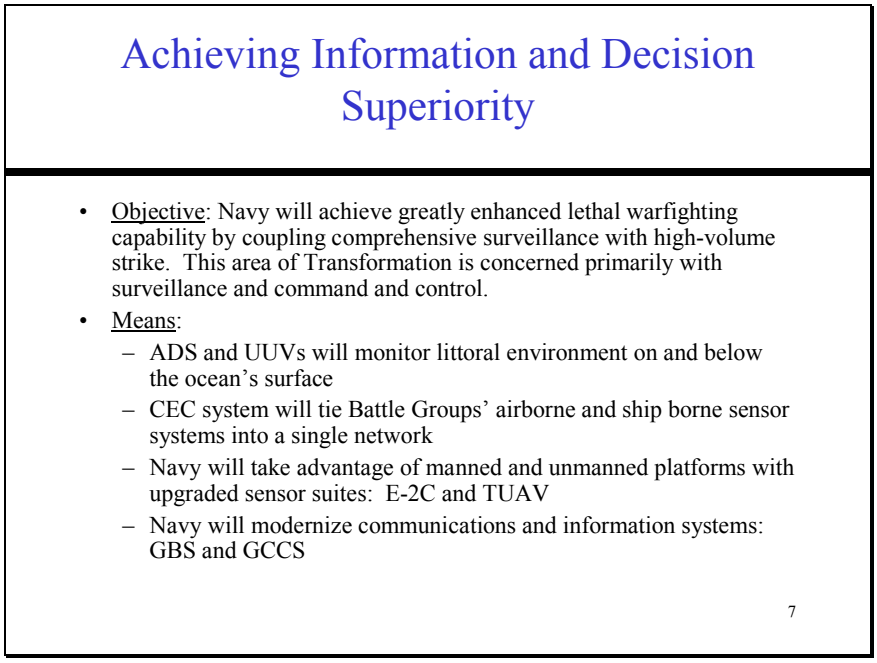
First, while these four war-fighting areas were defined to help focus our thinking and analyze the use of the Navy's assets, in practice there will often be an overlap of the way in which assets are deployed. For example, the E-2C is an important asset associated with achieving information and decision superiority and also dominating land, sea, air, and space battlespace. Since the focus of this symposium is estimating the cost of Navy assets associated with the transformation, in this presentation I will not make multiple references to the same systems that could be used in more than one transformation area.

Second, it is very difficult, and perhaps meaningless, to segregate Navy war-fighting capabilities into those that are transformational in nature and those that are not. So, for discussion purposes, I have tried to focus on both some conceptual projects not yet in existence and some existing assets that might be used in ways different from the past.



Now, returning to the structure of the four transformational areas, we note that Naval forces must be able to set the conditions and establish control in either a hostile environment or a permissive environment. To have this flexibility, the Joint Response Force concept must provide: deployable Joint Command and Control systems; tailorable force modules that train and exercise together; robust connectivity; pervasive networks of intelligence, surveillance, reconnaissance and targeting assets; long-range precision strike ability and information; and forward-deployed forces.

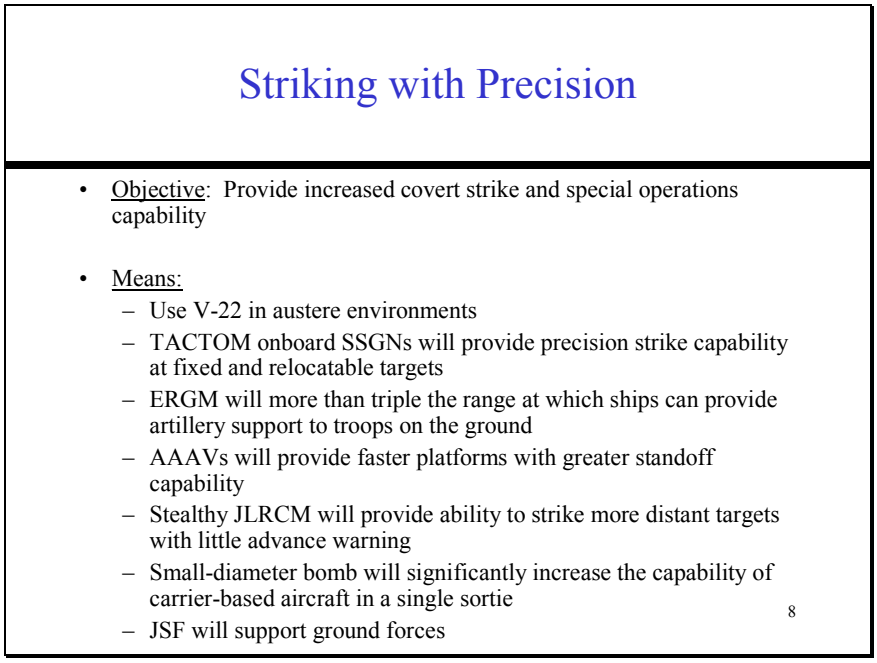
The next four slides discuss the Navy's objectives, and the primary means of achieving those objectives, of the four general areas of transformation shown here. Then I will move on to discuss the assessment of the Navy's ability to estimate the cost of these identified means.



The critical elements necessary to achieve information and decision superiority are: command and control; information and communications; intelligence, surveillance and reconnaissance; and information operations.

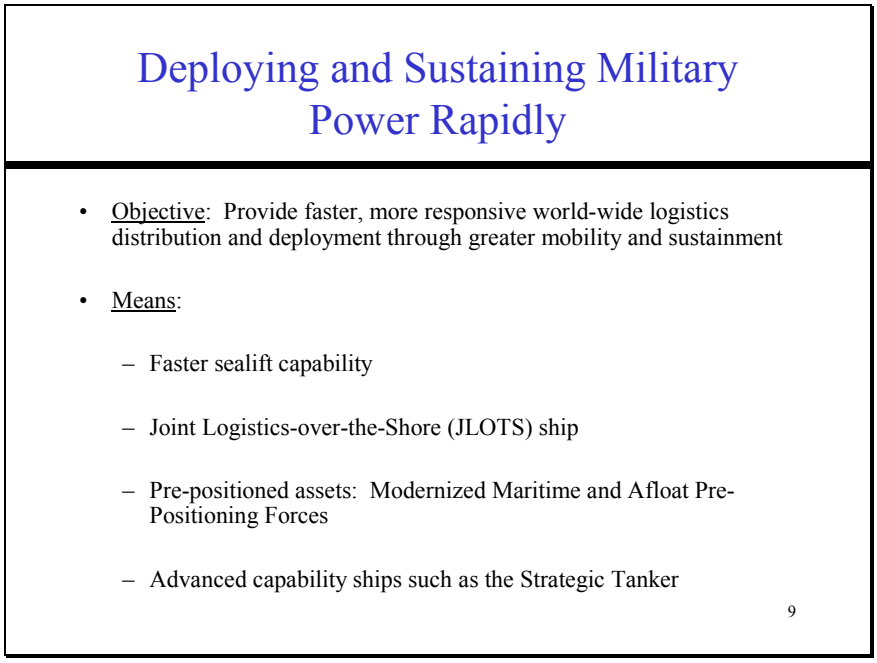
The following capabilities are necessary to achieve the objective: a cohesive Joint Command and Control system able to conduct rapid and decisive operations; web-based, robust wide-band, ubiquitous networks with associated information management capability; a shared, comprehensive, dynamic depiction of the entire battle space.

Key Navy programs for accomplishing this area of transformation include: underwater surveillance provided by Advanced Deployable System (ADS) and Unmanned Underwater Vehicles (UUVs); Cooperative Engagement Capability (CEC) which will unite Battle Groups' airborne and ship borne systems into a single integrated network; air and surface monitoring by E-2Cs and Tactical Unmanned Aerial Vehicles (TUAVs); and modernized command, control and communications systems, such as Global Broadcasting System (GBS) and Global Command and Control System (GCCS).



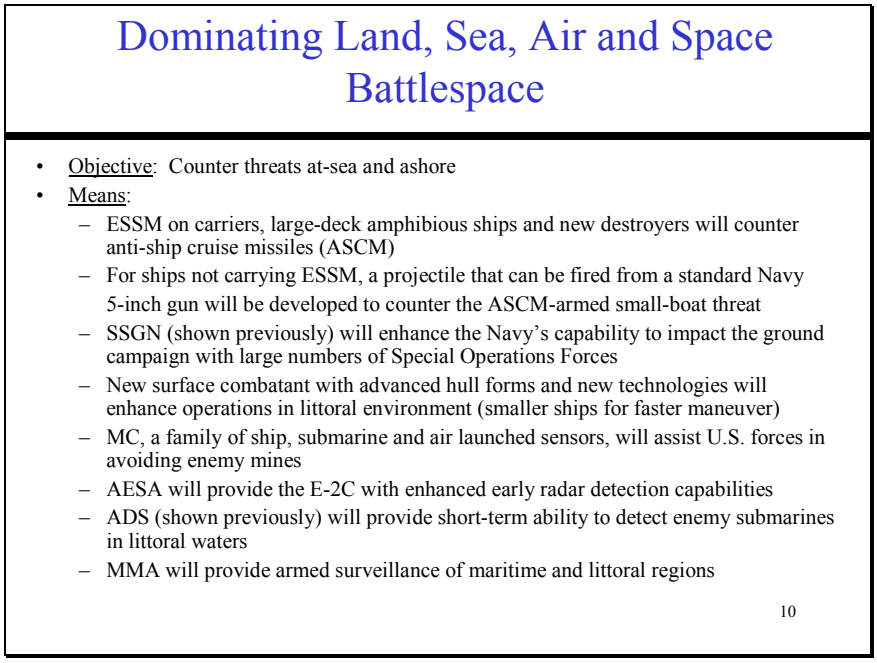
The critical elements necessary to achieve striking with precision are: long-range precision attack; time-critical precision targeting; supporting forces; and direct force insertion. The following capabilities are necessary to achieve the objective: intelligence, surveillance and reconnaissance assets that can locate key adversaries' defenses; stealth aircraft with precision munitions; cruise missiles with precision strike capability; escort aircraft for force protection; and direct insertion forces with standoff protection.

Key Navy programs for accomplishing this area of transformation include: use of V-22 in austere environments; converting four Ohio SSBNs to SSGNs with the maximum number of Tactical Tomahawk (TACTOM) cruise missiles; use of the Extended Range Gun Munition (ERGM); use of Advanced Amphibious Assault Vehicles (AAAV) as the centerpiece of future U.S. Marine Corps mobility; producing the Small Diameter Bomb; developing stealthy Joint Long-Range Cruise Missile (JLRCM); fielding and use of JSF to support ground forces.



The critical elements necessary to achieve deploying and sustaining military power rapidly are: command and control; deployment; focused logistics; and forward basing and infrastructure. The following capabilities are necessary to achieve the objective: ability to lift a high volume of personnel, equipment or supplies by fast advanced airlift; ability to deploy by strategic or theater sealift at speeds significantly faster than today's ships; reduced dependence on developed ports and large destination airfields; and ability to exploit pre-positioned assets by substantially improved speed and ability to move them intra-theater.

Key Navy programs for accomplishing this area of transformation include: high-speed sealift ships capable of sustained speeds of 45 knots with significant on/offload capability; joint logistics-over-the-shore (JLOTS) to enable sea-state three (5-8 foot vs. current 2-3 foot) seas capability; Modernized Maritime and Afloat Pre-positioning Forces that enable rapid deployment and application of forces to crisis locations; and advanced capability ships, e.g., the strategic tanker.



The critical elements necessary to achieve dominance of land, sea, air and space battlespace are: command and control; maneuver and mobility; intelligence; firing systems; logistics; protection; and nuclear, chemical and biological defenses.

Many of the key Navy programs identified under the previous three areas of transformation are also clearly applicable to the dominance of land, sea, air and space battlespace. They include CEC, V-22, AAAV, TUAV, UUV, ADS, E-2C Upgrade, SSGN conversion, TACTOM and JSF. Additional key Navy programs for accomplishing this area of transformation include: Evolved Sea Sparrow Missile (ESSM); Special Operations Forces embarked on SSGNs; a new-technology surface combatant for operations in a littoral environment; an organic Mine Countermeasures (MC), a family of ship-launched, submarine-launched, and airborne sensors and weapons integral to the neutralization of mines for the Battle Group; the Active Electronically Scanned Array (AESA); and the Maritime Multi-Mission Aircraft (MMA).

Capabilities to Estimate Costs

- Assessments on the following slides are based on the assumption that an established baseline is available for all systems
- Dependent on Cost Analysis Requirements Description (CARD) availability
  - Desired for Milestone A
  - Essential for Milestones B and C
- In the absence of a CARD, future systems:
  - Might use high level parametrics/CERs
  - Might estimate at the total system or program level
- Need data: cost, schedule, technical
- Need cost estimating methods/models/CERs

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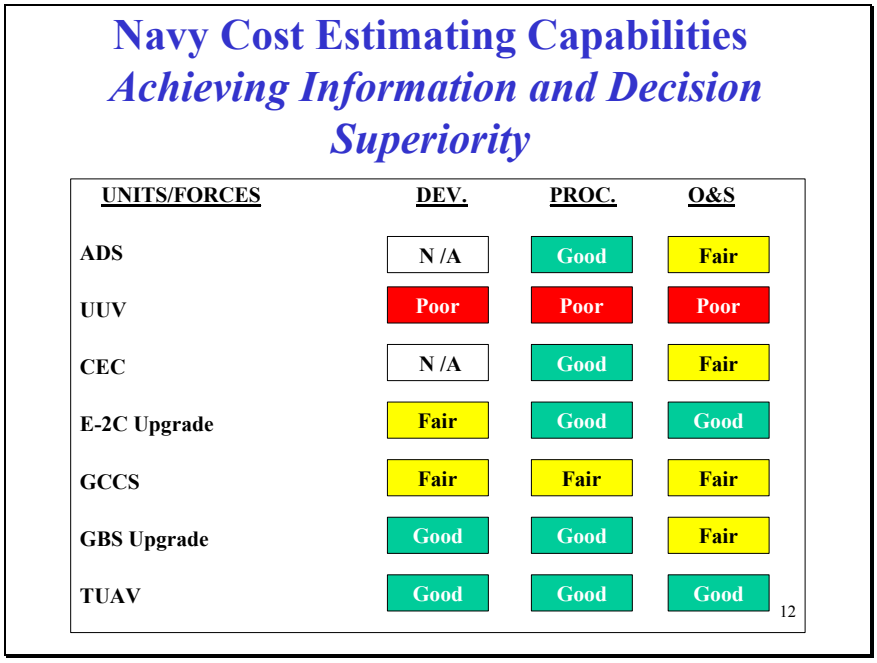
The ability to estimate the cost of any weapon system is dependent upon an established baseline: the cost estimator must know how much of what is to be acquired, and when. That is true whether or not the system is one associated with the transformation. The more thorough and comprehensive the baseline, the better product the cost estimator will produce. The Cost Analysis Requirements Description (CARD) should provide the degree of completeness needed with respect to the baseline. Though highly desirable, CARDs are often not available at Milestone A, but they are essential at Milestones B and C.

Assuming the existence of a CARD for a milestone, the capability to estimate the cost of the transformation is essentially the same as to estimate any system. However, when we are thinking about the transformation, we may be considering future systems for which there is no well-defined concept, much less a baseline or CARD. In those situations, we might have to resort to a high-level parametric approach, or even estimate at the total system or program level.

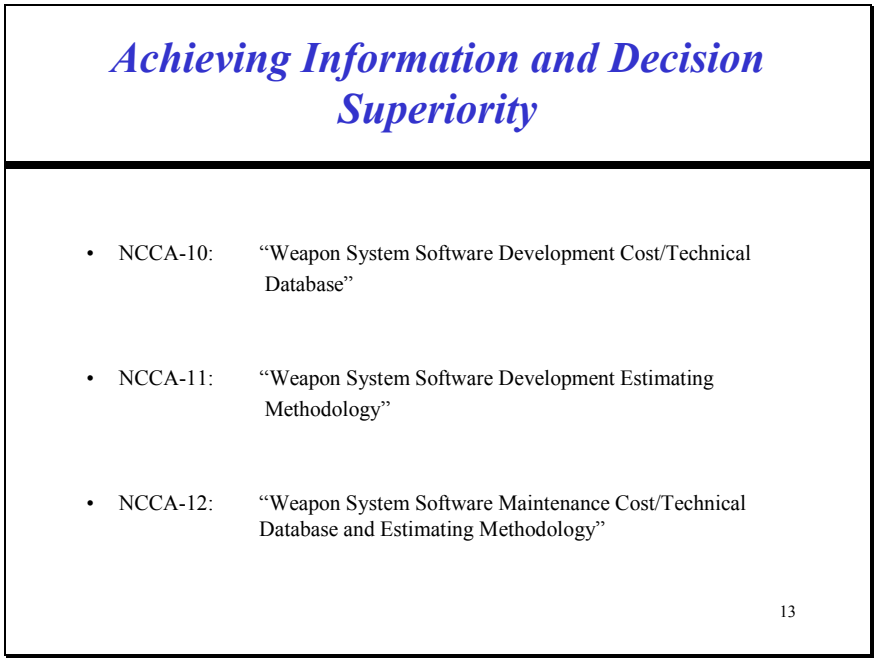
As with any cost-estimating situation, several fundamental tools are needed if we are to have the ability to estimate the cost of the transformation. We need several types of data (cost, schedule, and technical), and cost estimating methods/models/CERs.



We think it is most useful to discuss our capabilities to estimate the cost of weapons systems by phase of the life cycle. To do so, we have chosen a somewhat subjective color scheme to indicate our capabilities to estimate, by life-cycle phase, the cost of weapon systems associated with the four transformational areas. Red indicates that our ability to estimate the cost is poor to non-existent; yellow, that our ability is fair; and green, that our ability is good. We used an assessment of not applicable (N/A) for weapon systems whose development phases have essentially been completed.

The weapon systems shown on this slide are identified as important to the transformational area "Achieving Information and Decision Superiority", but some of them are also identified with others areas of the transformation. With the exception of Unmanned Underwater Vehicles (UUVs), our capability to estimate the costs of these systems is considered fair to good.

It is difficult to estimate the cost of UUVs because we have so little experience with them, and there are no on-going studies that might assist us in this area. However, for most of the systems shown on this slide, there are ongoing studies that can be of assistance in estimating their costs. The next slide addresses some of the ongoing studies that provide cost-estimating capabilities for the weapon systems shown here. I will associate each referenced study with the appropriate weapon system, and indicate the phase of the life cycle to which it has primary relevance.



NCCA-10 This software development technical database collects objective metrics (i.e., SLOC, effort, schedule, language, etc.) for weapon system programs, primarily Navy. The database is comprised of all platforms, including shipboard electronics and avionics. The database contains data from various contractors (i.e., Raytheon, COMPTEK, Lockheed Martin, etc.). All data is collected via an automated data collection form that was developed in MS Excel. The data ranges from the early 1980's to the late 1990's and covers various types of development processes.

NCCA-11 The weapon system software development estimating methodology will use data collected for the software development technical database. The methodology will update the current Software Development Estimating Handbook Phase I, as well as provide contractor specific estimating methodology. The equations will have associated statistics to support all algorithms and factors.

NCCA-12 Software data for this effort are collected primarily from Government software maintenance facilities. It uses Trouble Reports, ECPs and efforts associated with opening and closing reports (time spent on that ECP or trouble report). The methodology portion includes a curve to show distribution of Trouble Reports and ECPs over time. Most of the data up to this point have involved shipboard electronics. This study is developing estimating equations to project maintenance costs over time and maintenance cost per Trouble Report and ECP. The three NCCA software-related studies could be applicable to any of the units/forces in this transformational area.

Achieving Information and Decision Superiority (Cont'd)

- NAVAIR-2: "SLAP/SLEP Full Scale Testing Model"
- NAVAIR-3: "Demilitarization/Disposal Model"
- AFCAA-16: "Aircraft Software Data Track"

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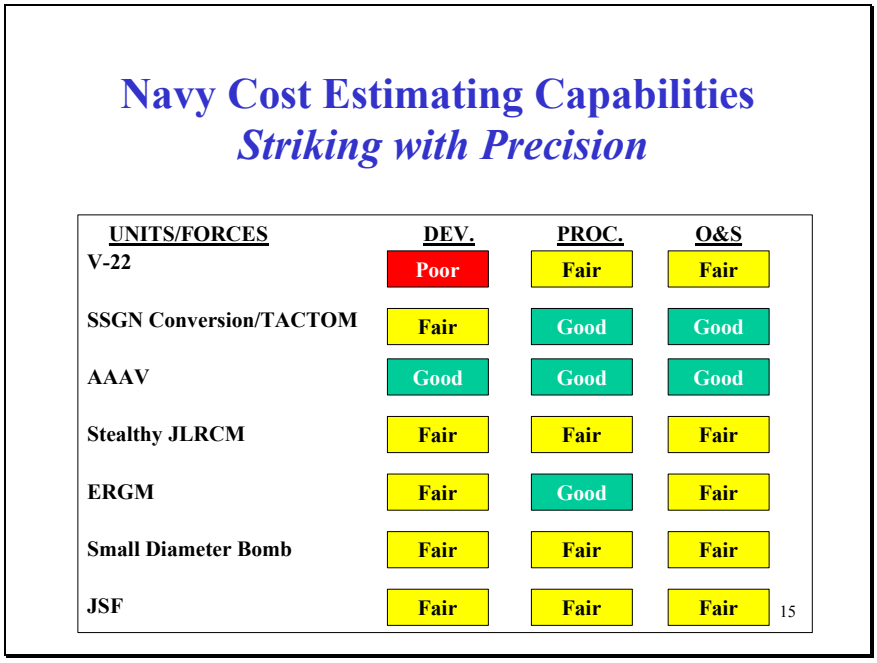
NAVAIR-2 This study uses the results of existing technical information and inputs from class desk personnel supporting programs currently evaluating Service Life Assessment Program (SLAP)/Service Life Extension Program (SLEP) efforts to build an estimating model approach to estimating SLAP/SLEP and associated testing efforts. This model researches cost history for past SLAP/SLEP programs to identify key costs and cost drivers and uses existing AV-3M/VAMOSC data to assess airframe maintenance and service bulletin cost trends. Using results of technical inputs and cost data, the study develops a simple model to aid in quick turn around assessments of the costs and potential O&S benefits of these types of programs. This study could be useful in addressing the O&S costs of the E-2C Upgrade.

NAVAIR-3 This effort focuses on 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 or demobilization costs for a given Type/Model Aircraft. The current model for the ongoing Environmental Consequences of Hazardous Operations (ECHO) project may be used in the development of this model. This effort also has applicability to the E-2C Upgrade.

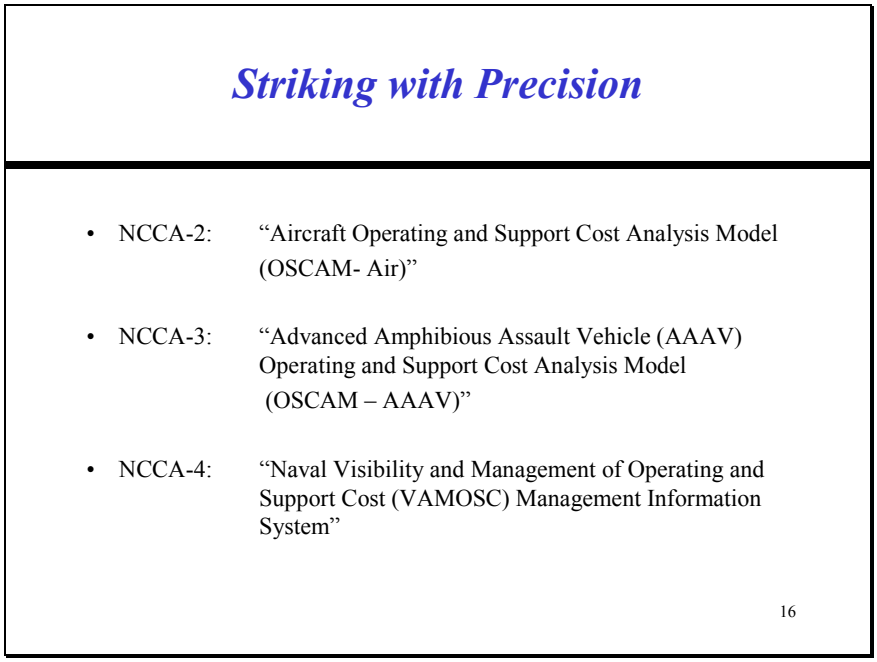
AFCAA-16 This project will collect software cost metrics from historical and current aircraft programs. Metrics may include Source Lines of Code (SLOC), reuse assessment, language, hours required for the individual development phases, calendar time required for the individual development phases, the

development platform, and dollars required to complete the development. Data from this study can be used to complement data from NCCA-10 in the development of software CERs.



The weapon systems shown on this slide are identified as important to the transformational area "Striking with Precision," but some of them are also identified with other areas of the transformation. With the exception of V-22 Development, our capability to estimate the costs of these systems is considered to be mostly "fair". As expected, our capabilities are weaker in the development phase than in the procurement and O&S phases.

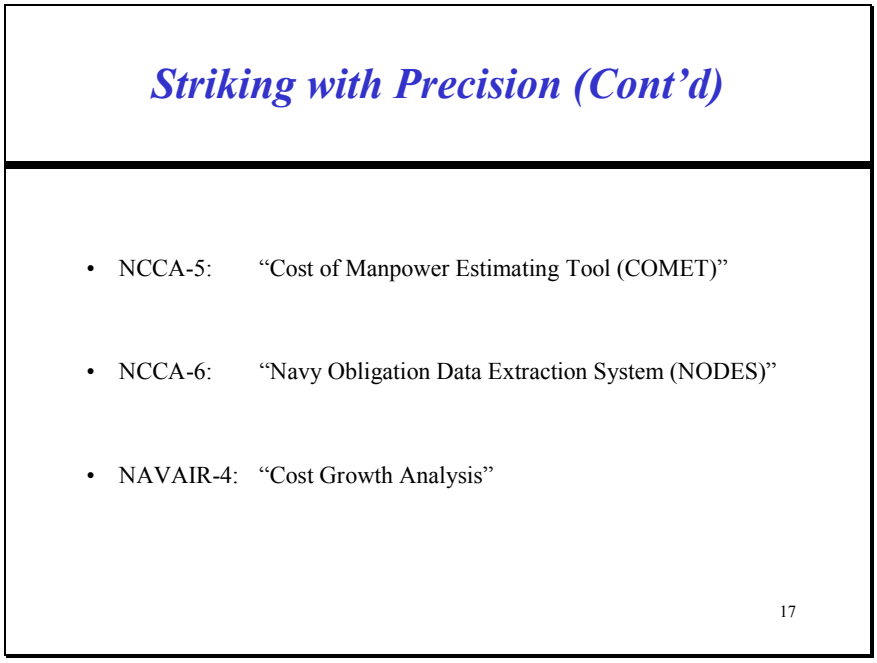
For some of the systems shown on this slide, there are ongoing studies that can be of assistance in estimating their costs. The next slide addresses some of the ongoing studies that provide cost estimating capabilities for the weapon systems shown here. I will associate each referenced study with the appropriate weapon system, and indicate the phase of the life cycle to which it has primary relevance.



NCCA-2 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 traditional tools. 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.

NCCA-3 This model is another in the "family" of system dynamics models developed by NCCA. The methodology and application of this model are similar to the OSCAM-Air model.

NCCA-4 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.

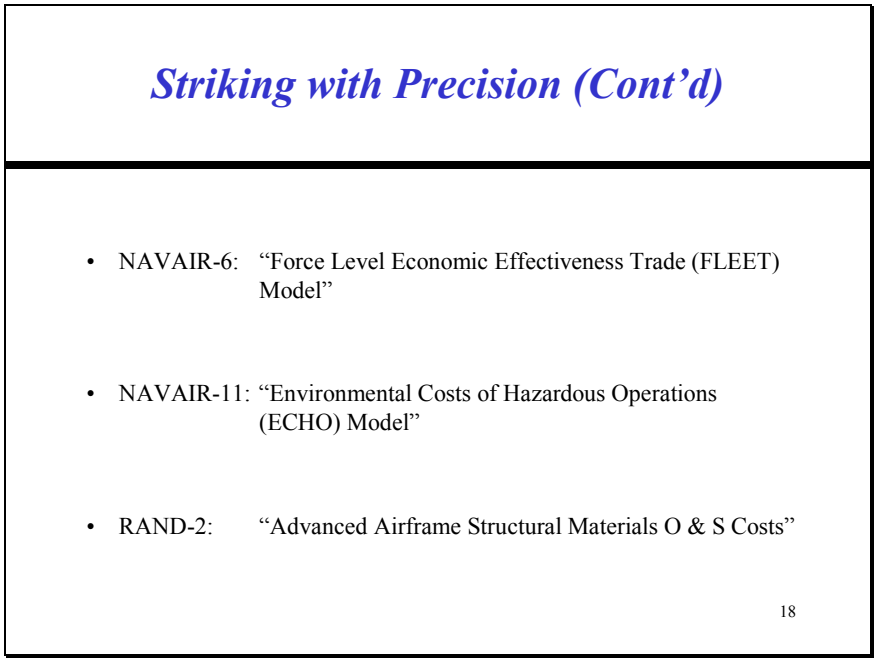


NCCA-5 COMET is a software database and cost-estimating tool that provides users with the Operating and Support (O&S) estimates for the costs (MPN and O&MN) of Navy manpower (active duty, reserve and civilian components). The "active duty" component identifies historic Cost Estimating Relationships (CERs) between the "direct" (MPN) costs of our "deployable" forces (ships, squadrons and other "sea duty" personnel) and the "variable indirect" costs (MPN and O&MN) associated with "shore duty" personnel that recruit, train and support those "deployable" forces and themselves. The model presents the user with a high degree of cost granularity. The use of variable indirect personnel costs in COMET is appropriate only for considering intra-Navy alternatives.

NCCA-6 NODES is a detailed, fully integrated, total operating and support cost database that complements the direct costs in VAMOSC. NODES includes all costs in the OMN and MPN appropriations and is consistent with Navy programming, budgeting, and accounting systems. NODES will be enhanced to include more appropriations, more detail and better linkage between indirect costs and weapon systems. NODES has applicability to all three phases of the life cycle for any program or weapons system, but is of primary importance to the O&S phase.

NAVAIR-4 This effort investigates the historical cost growth experienced on Navy aircraft, weapons, and avionics programs. Data are being analyzed for specific NAVAIR programs, for NAVAIR commodity groups, and collectively

for all NAVAIR programs including ACAT I, II, and III programs. The data are being organized in a cost growth database. The analysis will result in a conceptual approach for NAVAIR cost risk estimation, and can be applied to the V-22 and JSF programs.

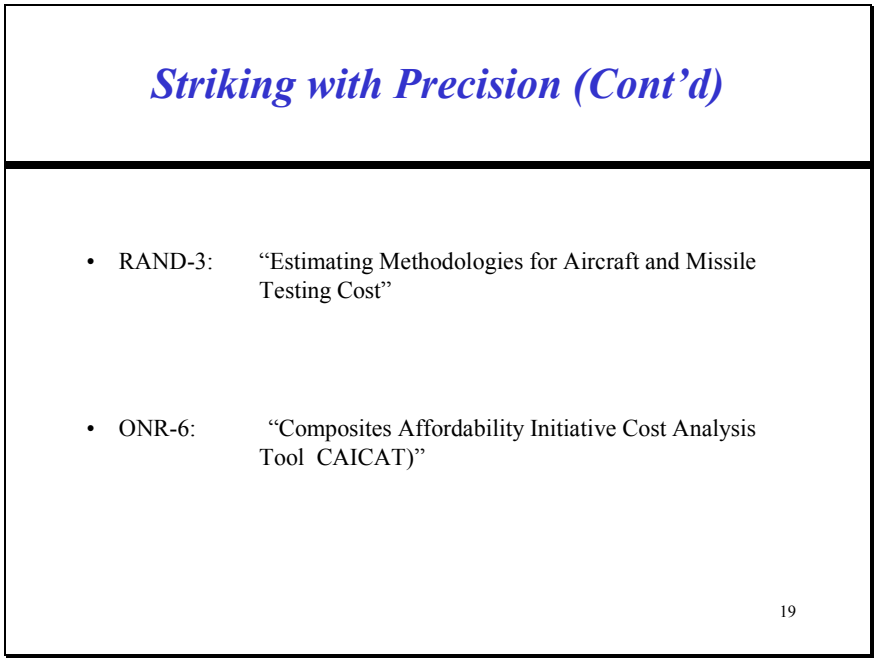


NAVAIR-6 This model is being developed to provide quick and reasonably accurate life cycle cost estimates for all active Navy aircraft programs. The FLEET model will provide cost insights on deferring development of follow-on aircraft, evaluating aircraft production rate alternatives, identifying potential Type/Model/Series aircraft for removal from the inventory, and determining when requirements for increased O&S costs and platform critical modifications reach levels that will require either a replacement, major upgrade or retirement decision. This model can be applied to the V-22 and JSF programs.

NAVAIR-11 The ECHO 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. As part of the present effort 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. This model will assist in estimating life cycle costs of the V-22 and JSF.

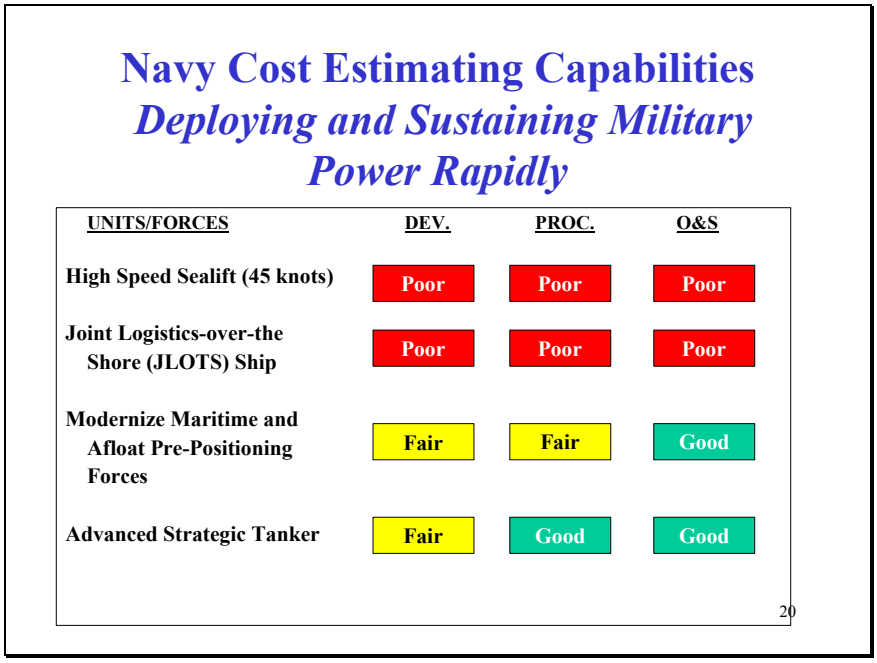
RAND-2 This project will assess the impact on the operating and support costs of military aircraft of advanced airframe structural materials versus conventional aluminum. The research will focus on all operating and support costs related to the material characteristics of aircraft components as a function of age for a variety of Air Force and Navy aircraft. The products from the research will be better methodologies for use by cost analysts in estimating

organizational, intermediate, and depot maintenance labor and material costs. This will provide better estimates of maintenance costs for DoD Milestone reviews, as well as for developing operating and support budgets for the services. This model will assist in estimating life cycle costs of the V-22 and JSF.



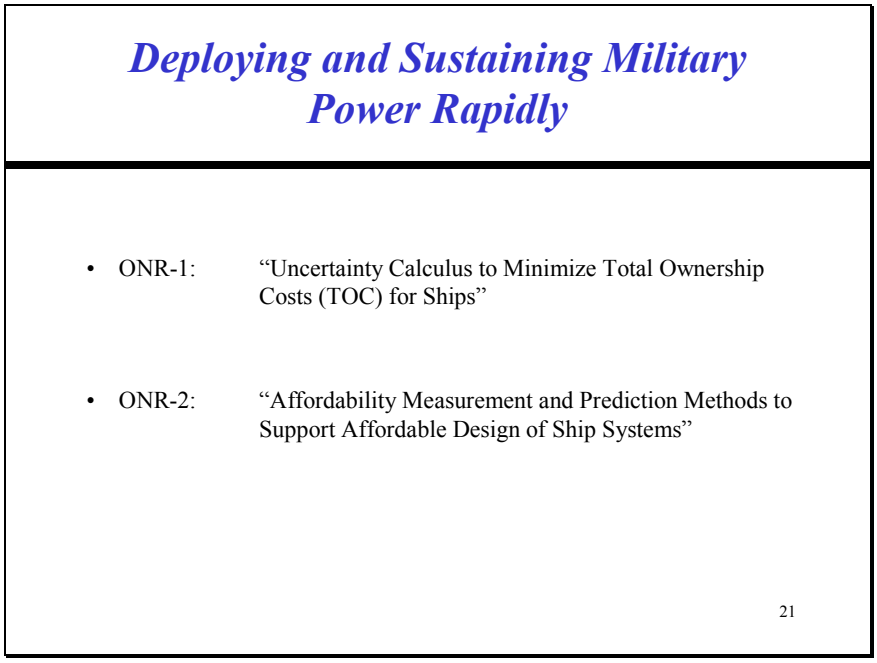
RAND 3 The objective of this project is to analyze the nature of current aircraft and missile test and evaluation costs and trends likely to affect them in the immediate future. It will Identify key cost drivers in the testing processes and develop a set of practical, documented cost estimating methodologies. These methodologies should be useful in developing estimates in the early stages of a program, before detailed technical and programmatic information is available, as well as for cross-checks later in the weapon system development phase when more of these details should be available. This effort will assist in estimating life cycle costs of the V-22, JSF and Stealthy JLRCM.

ONR-6 CAICAT is a cost model developed jointly by AFRL, NAVAIR, Northrop Grumman, Boeing, Lockheed Martin, and General Electric. The program has a goal of developing a credible, rapid cost evaluation system for an airframe structure to address state-of-practice, state-of-the-art, and merging design and manufacturing technologies. The Bottoms Up, Process-Based Model is incorporated in CAICAT software, which addresses all elements of direct and indirect costs. The software is intended to be used primarily as a trade study tool. This effort could assist in estimating life cycle costs of the V-22 and JSF.



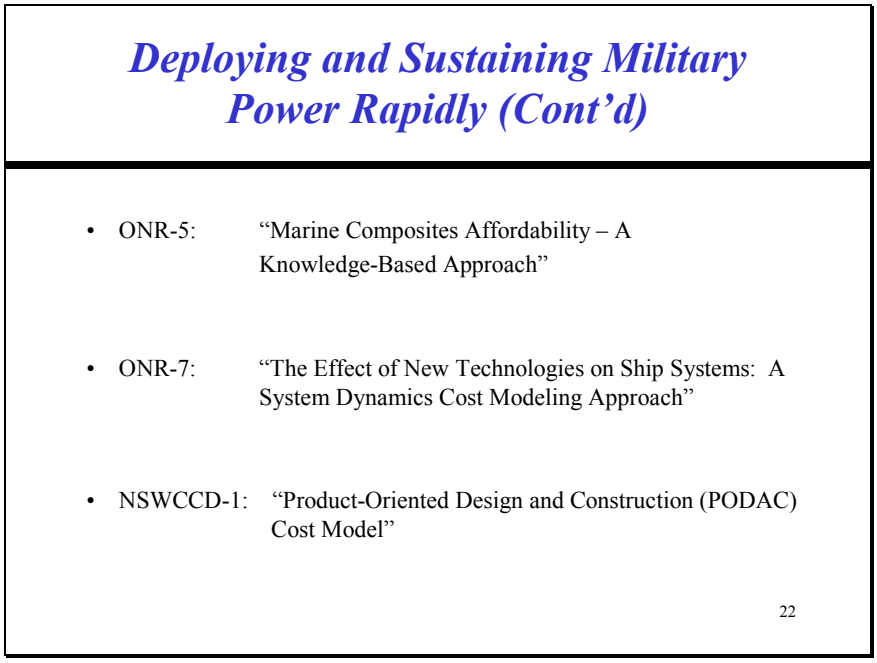
The weapon systems shown on this slide are identified as important to the transformational area "Deploying and Sustaining Military Power Rapidly". As indicated by the red on this slide, overall our cost estimating capabilities in this transformational area are pretty weak. This area includes two advanced-concept ships, both of which encompass highly optimistic capabilities and neither of which is well defined. We have little-to-no capability to estimate the cost of a 45-knot High Speed Sealift ship, or the Joint Logistics-Over-the-Shore ship. There are no ongoing studies that would improve our capabilities in this area.

However, a number of ongoing studies provide capability to estimate the cost of pre-positioning ships and the advanced strategic tanker. Most of these studies have an impact in dealing with environmental and disposal issues and in estimating the O&S phase.



ONR-1 The purpose of this study is to address affordability of ship systems by close collaboration with Navy programs to cooperatively develop mathematical models using uncertainty calculus to minimize TOC for Navy Ships. This effort includes development of a Maintenance Cost Model, a Technology Insertion model, and Geometry Cost Evaluation model. The Maintenance Cost Model would be very useful in estimating O&S costs for a new class of ships. At this point, the ONR efforts discussed on this slide have produced primarily demonstration models.

ONR-2 Maximum reduction of cost can occur early in ship design when there is significant uncertainty, and where historical and probabilistic data are absent, and uncertainty based systems are necessary. This project uses uncertainty based heuristic methods to develop a hierarchical and extendable decision tool. Maintenance, repair and overhaul represent major and difficult to predict components of TOC. By developing a fuzzy system and probabilistic methods to address maintenance costs, new capability can be developed, which is not possible with current historical and parametric cost models. This project also includes plans for software evaluation and development with provisions for interoperability with ASSET, VAMOSC and other database/models. This project develops a flexible and extendable tool providing automation and decision support for Navy S&T managers. As a cost-estimating tool, it is most useful in the design and O&S phases.



ONR-5 To help reduce TOC for ships, 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 TOC on a component-by-component basis. This project would be useful for estimating development and procurement costs of major ship structure components.

ONR-7 The introduction of new technologies often causes a temporary loss of productivity and leads to additional unforeseen costs over a system's life cycle. One of the reasons for this productive degradation is that traditional systems engineering management fails to plan for the effects of technology procurement, implementation, and maintenance. 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 modeling approach with an embedded optimization routine called Data Envelopment Analysis. This study will be useful for cost trade-offs in ships' development and procurement phases.

NSWCCD-1 The focus of this model is to support engineering tradeoff studies. This cost model will be sensitive to changes in shipbuilding strategies, ship construction processes, use of common modules, zonal architecture and equipment standardization. Partial functionality was demonstrated in a

prototype PODAC model in 1997. Since then, Version 6.0 has been implemented at NSWCCD and the four surface shipyards. Cost model validation testing has been performed at two shipyards.

Deploying and Sustaining Military Power Rapidly (Cont'd)

- NSWCCD-2: "Leading Edge Advanced Prototyping for Ships (LEAPS) Cost Support"
- NSWCCD-3: "Force Level Ship Environmental Cost Model"
- NCCA-1: "Ship and Shipboard System Operating and Support Cost Analysis Model (OSCAM-Ship, OSCAM-Systems)"
- NCCA-9 Ship Construction Cost Database (SCCD)

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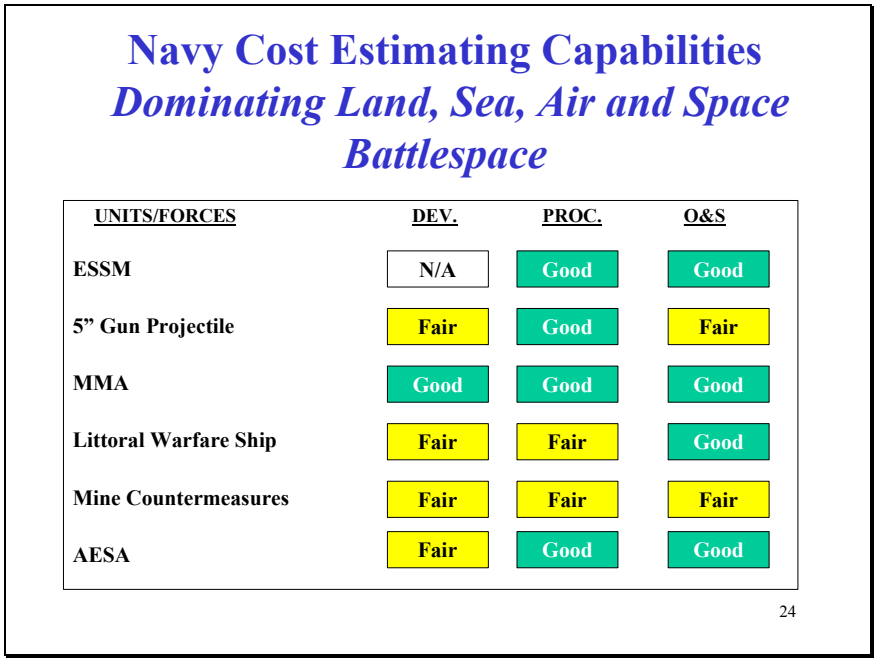
NSWCCD-2 This effort incorporates cost estimating and analysis capability into the Leading Edge Advanced Prototyping for Ships (LEAPS) integrated data environment. For selected cost analysis models, this effort provides lists defining the input variables required by the models, definition of the input variables and definition of the output.

NSWCCD-3 This effort develops a spreadsheet model to estimate the LCC of liquid and solid wastes for fleet level analysis. The model will input data from the Environmental Compliance database, the disposal cost model and the system level environmental quality cost models. Output will be force level acquisition and life cycle analysis.

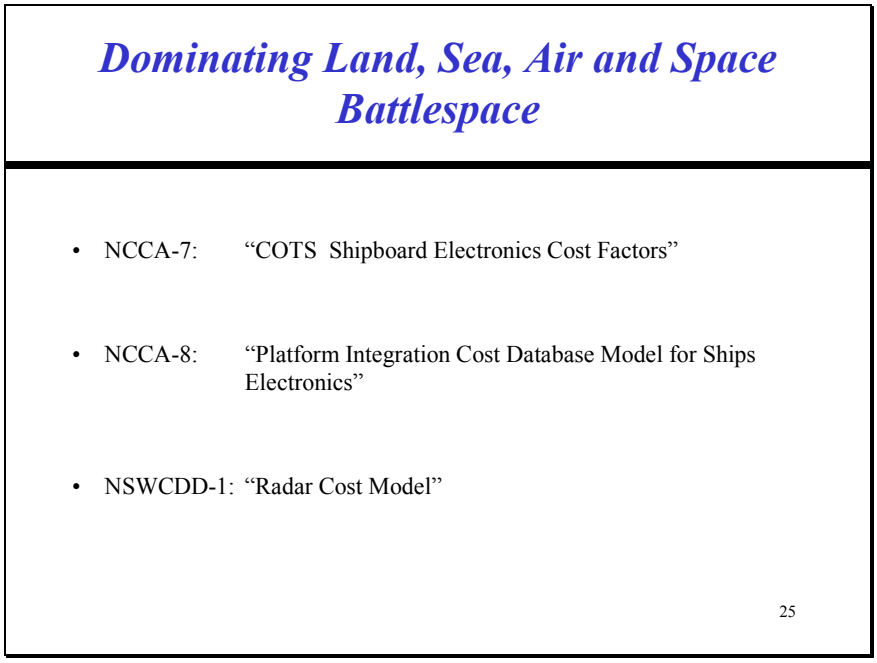
NCCA-1 This model is another in the "family" of system dynamics models developed by NCCA. The methodology and application of this model is similar to the OSCAM-Air model.

NCCA-9 The purpose of this effort is to develop a normalized database of historical ship construction costs and technical characteristics. The database will not contain any new data, but will be an accumulation of existing data in an Automated Cost Database (ACDB) format.



The weapon systems shown on this slide are identified as important to the transformational area "Dominating Land, Sea, Air and Space Battlespace", but some of them are also identified with others areas of the transformation. Since there is no red on this chart, and more green than yellow, our capability to estimate the costs of these systems is considered fair to good.

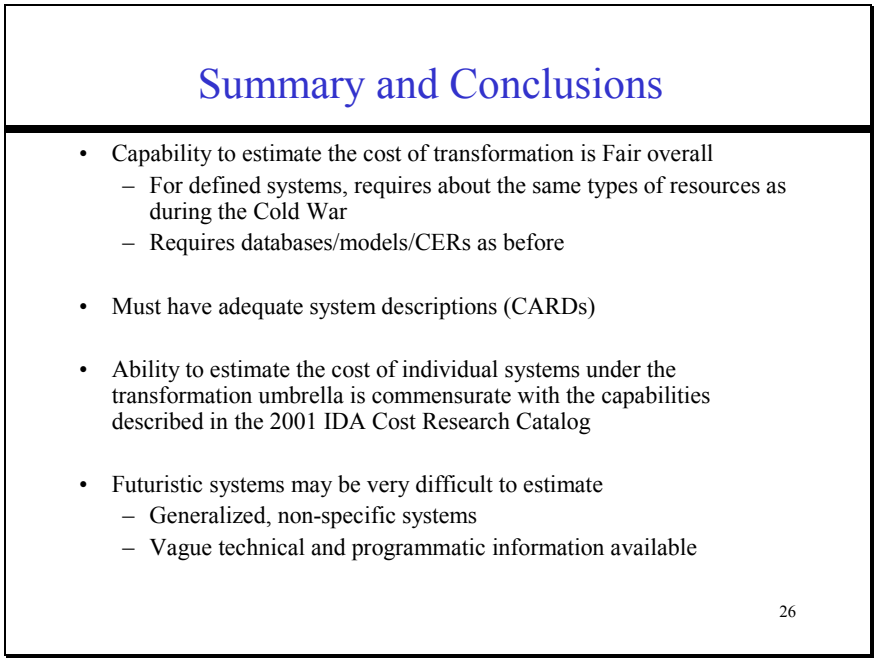
For some of the systems shown on this slide, there are ongoing studies that can be of assistance in estimating their costs. The next slide addresses some of the ongoing studies that provide cost estimating capabilities for the weapon systems shown here. I will associate each referenced study with the appropriate weapon system, and indicate the phase of the life cycle to which it has primary relevance. Additionally, many of the cost research efforts mentioned in the other transitional areas are also applicable to systems shown on this chart.



NCCA-7 The purpose of this study is to develop factors for estimating COTS shipboard electronics costs as a function of military specifications (MILSPEC) costs. It will use systems in which initial hardware was MILSTD and later upgrades or later installations used COTS. The final report will include raw and normalized cost data and will address the methodology and the resulting factors.

NCCA-8 This study will develop a database and cost estimating methodology for projecting hardware/software integration costs for shipboard electronics and weapon systems. The database will include cost data, technical characteristics, and other relevant information (e.g., software size) for a variety of systems, including sonar, radar, fire control, and launching systems. It will include both contractor and Government in-house costs. This is a multi-phased effort, with Phase I to concentrate on developing an integration WBS, identifying integration cost factors and initiating data collection.

NSWCDD-1 This effort is directed towards the development of CERs to estimate the engineering development and production costs associated with the major components of solid-state radar. CERs will be developed using a cost database of existing military radar development and production programs. The CERs will be implemented in an EXCEL spreadsheet model. This study may be useful in the AESA program.



In summary, we conclude that the Navy's capability to estimate the cost of the transformation is "fair" overall, assuming we have defined systems and baselines. This is about the same as our assessment of our ability to estimate the cost of weapon systems during the Cold War. Our ability to estimate the cost of individual systems under the transformation umbrella is commensurate with the capabilities described in the 2001 IDA Cost Research Catalog.

Certain elements are necessary for cost estimating in any environment: adequate system descriptions (CARDs), databases, and models/CERs. Futuristic systems are very difficult to estimate, because they may be generalized, non-specific systems having only vague technical and programmatic information available.

VIII. Air Force Perspective, Jay Jordan

Other organizations whose research projects will help us cost the transformation.

The Meaning of Transformation to the Air Force

U.S. AIR FORCE

Achieving Information & Decision Superiority
(Information Superiority)

- Command & Control
- Information & Communications
- Intelligence, Surveillance & Reconnaissance
- Information Operations

Striking with Precision
(Global Attack, Precision Engagement)

- Long Range Precision Attack
- Time Critical Precision Targeting
- Supporting Forces
- Direct Force Insertion

Deploying & Sustaining Military Power Rapidly
(Rapid Global Mobility, Agile Combat Support)

- Command & Control
- Deploying
- Focused Logistics
- Forward Basing & Infrastructure

Dominating Air, Space, Land, & Sea Battlespace
(Aerospace Superiority)

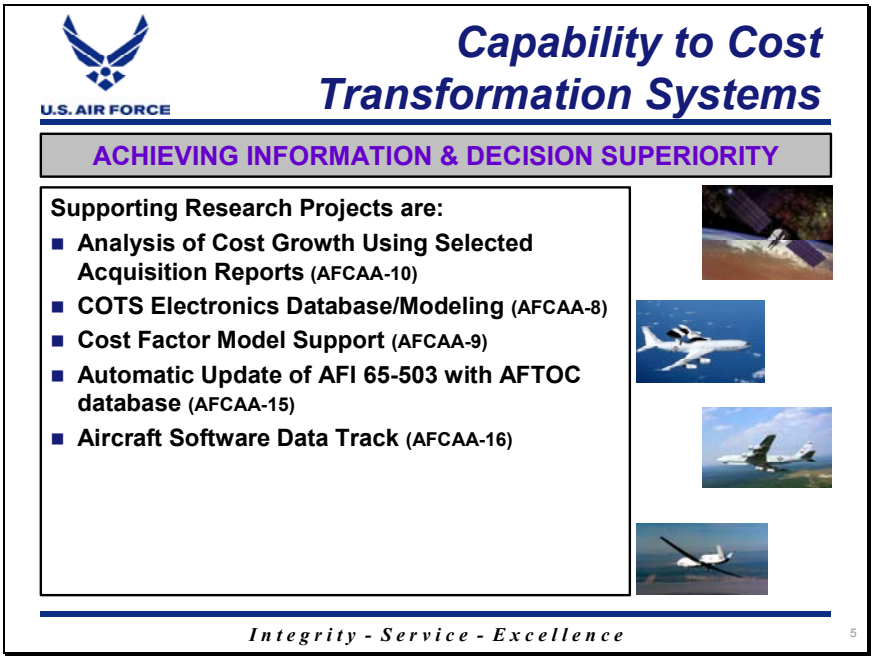
- Command & Control
- Maneuver & Mobility
- Intelligence
- Fires & Precision Attack
- Logistics
- Protection
- Nuclear, Chemical, & Biological Defenses

Capability to Cost Transformation Systems

U.S. AIR FORCE

ACHIEVING INFORMATION & DECISION SUPERIORITY

- Extremely High Frequency (EHF) & Laser Satellite Communications (SATCOM)
- Global Positioning System (GPS) Modernization
- Upgrade Advanced Airborne Warning And Control System (AWACS) Sensor Suites
- Upgrade Joint Surveillance Target Attack Radar System (JSTARS) Sensor Suites
- RC-135 – Rivet Joint
- Global Hawk
- Predator
- Global Command & Control (GCCS)
- Computer Network Defense/Computer Network Attack
- Modified Global Broadcast Service (GBS) Terminals
- Joint Tactical Radio System (JTRS)
- Joint Airborne Command Relay



SAR Study—categorizes cost growth by Service, type of system and cost growth when compared to Milestone estimates.

- **Supports:** Applies to all four categories
- **Status:** Completed

COTS Effort—includes data collection of hardware costs for electronic components (including new and commercial technologies); develops CERs

- **Supports**: Joint Tactical Radio System (JTRS), Joint Airborne Command Relay, Modified Global Command & Control (GCCS), Computer Network Defense/Computer Network Attack
- **Status:** Ongoing

Cost Factor Model—objective is to create an electronic repository for annual TOC type cost information to aid in generation of CPFH and other data needed for Air Force Planning Projections and other types of cost estimation (AFI 65-503).

- **Supports**: RC-135, Global Hawk, Predator
- **Status:** Ongoing

Automatic Update to AFI-65 503 using AFTOC—a review AFTOC data to evaluate whether it supports producing cost factors for AFI 65-503—if successful, methods will be developed to automatically update factors on an annual basis

- **Supports:** Applies to all four categories
- **Status:** New

Aircraft Software Data Track—supports collection of data on aircraft programs in forms that will allow a direct feed into our software tools

- **Supports**: Global Command & Control, Computer Network Defense/Computer Network Attack, Modified Global Broadcast Service Terminals, Joint Tactical Radio System, Joint Airborne Command Relay, F-22, JSF, Ultra-Heavy Lifters and Advanced Theater Transport Aircraft
- **Status:** New

Improvements Realized

- Annual Inflation Indices and tutorial
- Overhead Study
- Missile CERs
- ACDB Missile Database Improvements
- ACEIT Enhancements

Weapon System Software Development Cost/Technical Database—expands software effort for Software Development Estimating Handbook

Weapon System Software Development Estimating Methodology—updates the current software data collection and software handbook; identifies and assesses commercially available software development estimating methodologies

AIS Life Cycle Cost and Technical Database—database of estimated AIS program costs, descriptions, cost methodology, programmatic/ technical description and assessment of the database's utility.

Hardware Deflator Methodology—collects Navy AIS hardware cost and technical data for estimating hardware. Commercial data will be collected and determination of life of various types of technology and applicability to the hardware process.

Automated Information System (AIS) Software Cost/Technical Database and Estimating—creates an automated AIS software development and maintenance database. Determines what metrics drive AIS software costs and develop cost estimating methodology

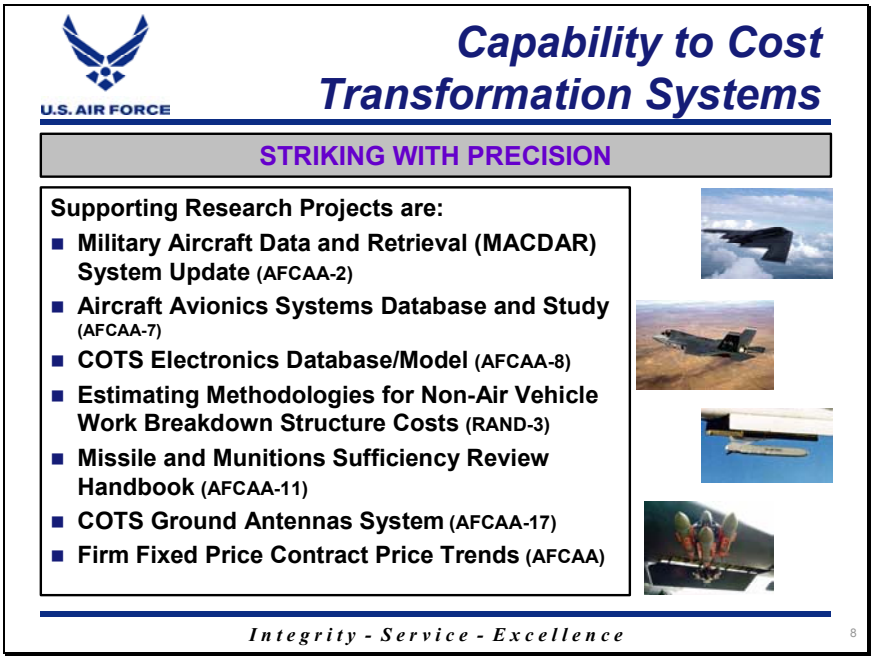
U.S. AIR FORCE

Capability to Cost Transformation Systems

STRIKING WITH PRECISION

- Space Based Radar (SBR)
- Global Positioning System III (GPS III)
- Ground Moving Target Indicator (GMTI)
- Enhance B-2A with Large Carriage Capacity and Flexible Targeting
- F-22
- Joint Strike Fighter (JSF)
- Global Hawk
- Conventional Air Launched Cruise Missile (CALCM)
- Joint Long Range Cruise Missile
- Joint Direct Attack Missile (JDAM) MK-83
- Joint Stand Off Weapon (JSOW)
- Joint Air to Surface Standoff Missile (JASSM)
- Small Diameter Bomb (SDB)
- Minuteman III (MMIII) Modernization

Integrity - Service - Excellence



MACDAR—provides data for analogy-based and CER-based approach for recurring and non-recurring aircraft system costs

- **Supports**: F-22, JSF
- **Status:** Ongoing

A/C Avionics Systems Database & Study—data collection effort supporting the estimation of costs for rapidly changing avionics programs; also contains CERs for federated and integrated avionics

- **Supports**: F-22, JSF, GMTI
- **Status:** Ongoing

COTS—already covered

Estimating Methodologies for Non-Air Vehicle Work Breakdown Structure Costs—identify key cost drivers in missile and aircraft BTL cost trends starting with T&E; develop cost estimating methodologies to be used early in program before detailed data is available; develop cross-checks for later in the development phase

- **Supports**: most aircraft/missile programs
- **Status:** Ongoing

Missile & Munitions Sufficiency Review Handbook—provides guidance on how to conduct checks for overall reasonableness of methods being reviewed; provide cross-checks for missile cost estimates

- **Supports**: JDAM, JASSM, JSOW

- **Status:** Ongoing; nearing completion of first phase

COTS Ground Antennas Systems—effort to collect performance specs and pricing to develop CERs

- **Supports**: GPSs Ground System, Global Command and Control, Computer Network Defense/ Computer Network Attack, Modified Global Broadcast Service Terminals, Joint Tactical Radio System, Joint Airborne Command Relay
- **Status:** New

Firm Fixed Price Contract Price Trends—discern price changes when competitively awarded contracts come out of options

- **Supports**: JSTARS, JASSM
- **Status:** New

Turbine Engine Costs: A Primer and Cost Estimating Methodologies

- Develop methodology to estimate future turbine engines and evaluate effects of DoD acquisition reform and industry affordability initiatives on engine costs.
  - Includes only turbo fan engines for jets, no helicopter engines. Props were not included since only 130's have prop engines in current inventory.
- Develop O&S support cost drivers and methodologies for O&S costs

USCM/PSCM

- Collect data for estimating space sensor payloads and communication payload at subsystem and component level.
- Will integrate into a new system called Space System Cost Model in FY03.
- Supports Space Based Radar, GPS III

A/C and A/C Mod Sufficiency Review Handbook

- Guidance for performing AoAs, POEs on aircraft and mods
- Collect and document metrics to be used to cross-checks estimates
- Supports F-22 JSF, Global Hawk, F-A/18 E-F

Passive Sensor Cost Model Data Collection (PSCM) & Unmanned Spacecraft Cost Model (USCM)—joint effort between SMC and AFCAA

Strategic Missile Model Update

- Develop methodologies for estimating missile systems
- Expand CERs
- Create interface to download to CO$STAT for CER development
- Extract CERs and move them into ACEIT
- Supports: Conventional Air Launched Cruise Missile, Joint Long Range Cruise Missile, JDAM, JSOW, JASSM

U.S. AIR FORCE

Capability to Cost Transformation Systems

DEPLOYING & SUSTAINING MILITARY POWER RAPIDLY

- Advanced Tactical Airlifter
- Ultra Heavy Airlifter
- C-5 Modernization
- Continue C-17 Procurement
- C-130 Modernization
- CV-22
- Advanced Strategic Tanker
- KC-10 Modernization
- Next Generation Small Loader
- Computer Network Defense / Computer Network Attack
- Global Combat Support System (GCSS)
- Global Transportation Network 21 (GTN-21)
- Defense Messaging System (DMS)

Aircraft Software Data Track—already covered

Aging Aircraft Study—collects and analyzes data enabling the estimation of aging effects by Mission/Design/Series of aircraft, as well as by airframe, avionics and engines categories

- **Supports:** C-130 Modernization, C-5 Modernization, KC-10 Modernization
- **Status:** New

Develop CPFH Contingency Calibration Factors—development of CPFH representing Contingency Operations and normalization of historical contingency operations data to peacetime scenario

- **Supports:** Advanced Strategic Tanker, Advanced Tactical Airlifter, Ultra Heavy Airlifter, C-17.
- **Status:** New

Advanced Airframe Structural Materials O&S Costs (SAF/AQ project with our tech monitor).

- Assess impact of O&S costs on advanced airframe structural materials versus conventional aluminum. Focuses on material composition. Create better methodologies for estimating organizational, intermediate and depot maintenance labor and material costs.

Aircraft Support Cost Estimating Relationships (SAF/AQ project with our tech monitor)

- Develop CERs for specific categories of O&S costs, i.e., software maintenance, mod kit acquisition and installation, sustaining engineering, depot level reparables, etc.

U.S. AIR FORCE

Capability to Cost Transformation Systems

DOMINATING AIR, SPACE, LAND & SEA BATTLESPACE

- Space Maneuver Vehicle (SMV) / Space Operations Vehicle (SOV)
- Space Based Radar (SBR)
- Space Based Infrared System (SBIRS)
- Evolved Expendable Launch Vehicle (EELV)
- Space Based Laser (SBL) and Airborne Laser (ABL) Technologies
- F-22, Joint Strike Fighter
- Ultra-Heavy Airlifters and Advanced Theater Transport Aircraft
- Unmanned Combat Air Vehicle (UCAV)
- Supersonic Strike Missile
- Advanced Stand Off Munitions (JASSM, LRCM)
- Small Diameter Bomb (SDB)
- Active Electronically Scanned Array (AESA) Radar
- Large Aircraft Infrared Counter Measure (LAIRCM)
- Computer Network Defense/Computer Network Attack
- Joint Tactical Radio System (JTRS)

Integrity - Service - Excellence

12

Aircraft Software Data Track—Already covered.

COTS Ground Antennas System—Already covered.

USCM/PSCM—Already covered.

Space Systems Costing Suite—Updating AERO Corp's launch vehicle and ground systems cost models to include infrared sensor payloads and new integrated ground stations design and costing models.

Costs of Space, Launch and Ground Systems—Contains 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, delays, failures, software, ground facilities, learning rates and cost overruns.

Small Satellite Cost Model—Parametric (CER-based) cost model including cost-risk analysis capability for estimating small or micro-satellites.

Measuring Return on Investment for Reliability and Maintainability Investments

- Quantify the impact of prior, current and future R&M mods by R&M primary purpose and by aircraft weapon system
- Develop and quantify the impact on future O&S costs
- Address any projected cost increases or savings estimating with the R&M modifications
- Attempt to determine if the estimated costs or savings have materialized.

Missile CER Development Phase III

- Collect new missile costs from program offices, AFCAA, and Selected Acquisition Reports to populate ACDB database
- Updating/validating existing CERs using new data points
- Expanding CERs to lower levels of the WBS, or deriving new CERs to capture latest technologies

Missiles & Munitions Sufficiency Review Handbook Ph II

- Updating metrics to include new data points
- Expanding the metrics to areas not covered in Phase I

Effect of Ramp Rate on Learning

- Study to determine whether the amortization of fixed costs over low quantities contributes to steeper cost curves?

- Study whether resultant learning curves reflect a steeper curve for the F-22 build-up than for other historical programs with larger quantities in the early lots and faster build-up rates
- Determine whether it is improper to use learning only to estimate curves which include fixed costs
- To analyze the effort that the application of learning/rate curves to procurement profiles produces and determine whether it is drastically different from history and may not always mimic learning curves with fixed costs

Contingency Cost Model Update

- Develop CPFH factors that represent Contingency operations
- Normalize historical data that reflects contingency operations to a peacetime scenario
- Develop marginal cost factors that measure the incremental costs in weapon system changes.

Aging Aircraft Study

- Assess aging aircraft by airframe, avionics, and engines
- Expand on those parametrics to Mission/Design/Series (MDS) aircraft
- Update previous information with more recent data

Measuring Return on Investment for Reliability and Maintainability Investments

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Missiles & Munitions Sufficiency Review Handbook Ph II

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U.S. AIR FORCE

Capability to Cost Transformation Systems

AIR FORCE				
	CTD	SDD	Production	O&S
Aircraft (Fixed Wing) & Weapon Systems	YR	Y	GY	YG
Space Systems (Space, Launch, Control)	YR	Y	Y	Y
C3I (Electronics) Systems	RY	Y	Y	Y
	CTD	SDD	Fielding	O&S
Automated Information Systems (AIS)	RY	Y	Y	Y

CTD ñ Concept & Technology Development
SDD ñ System Development & Demonstration
O&S ñ Operating & Support

U.S. AIR FORCE

Summary

AF Capability to Cost the Transformation overall Y

- **However critical areas include**
  - **Software and T&E** (FAIR/POOR)
    - Aircraft Software Data Track (AFCAA-16)
    - COTS Electronics Database/Modeling (AFCAA-8)
    - COTS Ground Antennas System (AFCAA-17)
    - Estimating Methodologies for Non-Air Vehicle Work Breakdown Structure Costs (RAND)
  - **Concept & Technology Development** (FAIR/POOR)
    - Aircraft Avionics Systems Database and Study (AFCAA-7)
    - Estimating Methodologies for Non-Air Vehicle Work Breakdown Structure Costs (RAND-3)
    - Aircraft Software Data Track (AFCAA-16)

U.S. AIR FORCE

Observations

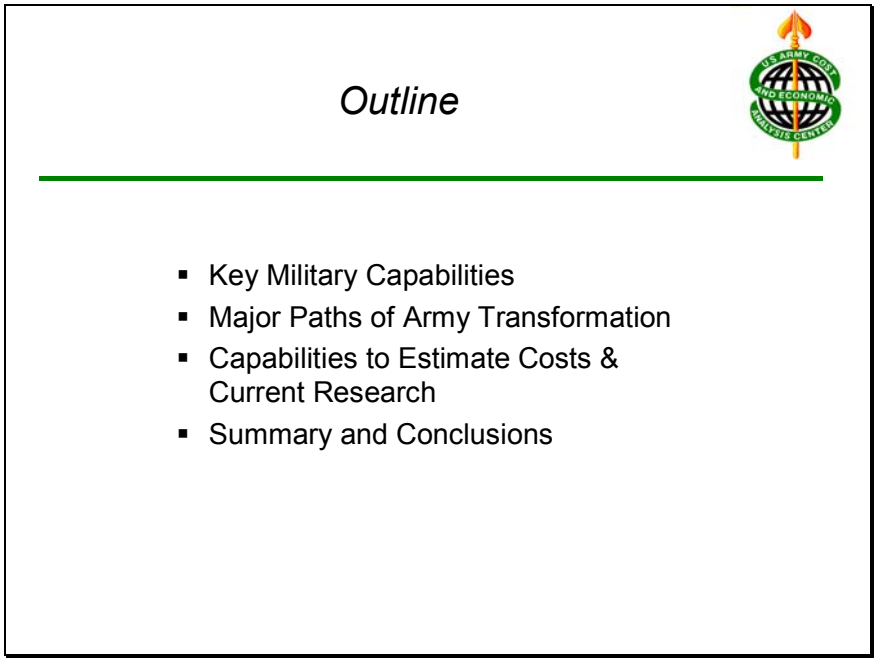
- **Significant obstacles must be addressed by senior leadership**
  - **Deletion and/or reduction in cost data collection/reporting**
    - Historical data is not supporting estimates of new technologies
    - Cost Savings/Reduction Initiatives
    - Over- reliance on System Contractor estimates
      - Common Cost Models
      - Total System Program Responsibility (TSPR)
      - Priced Based Acquisition (PBA)
  - **Non-standardization of data**
    - Resistance to CCDR reporting requirement
    - At odds with requirement to reduce cycle time
  - **Deletion of Program Definition/CARD requirement**
    - Spiral Development
    - Capabilities Based Acquisition

IX. Army Perspective, David Henningsen

Assessment of the Army Capabilities to Estimate the Cost of Transformation

2002 Cost Research Symposium

ARMY PRESENTER: DAVID HENNINGSEN
23 May 2002

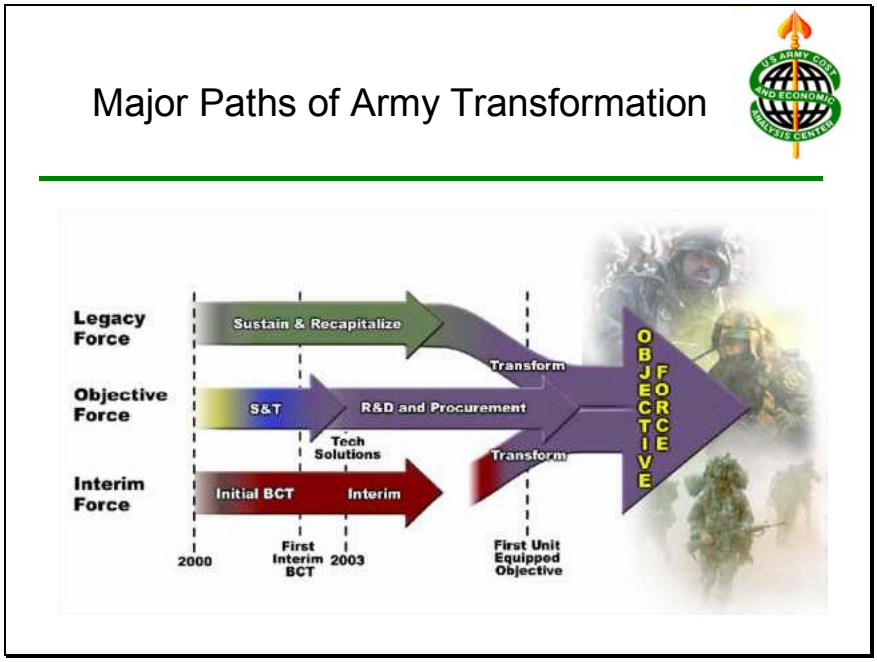


With a clear vision, we can anticipate future events and plan for them.

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

Transformation
Key Military Capabilities

- Achieving Information and Decision Superiority
- Striking with Precision
- Deploying and Sustaining Military Power Rapidly
- Dominating Land, Sea, Air and Space Battlespace



As you see here, the Army's comprehensive transformation advances along three major paths: Legacy Force, Interim Force, and Objective Force. The Army's transformation strategy will result in an Objective Force that is more responsive, deployable, agile, versatile, lethal, survivable, and sustainable than the present force.

Let me focus first on the Legacy Force. In order to have the time to develop Objective Force capabilities properly, we must sustain the Legacy Force to guarantee our warfighting readiness.

Our plans include recapitalization of selected formations of key armored and aviation systems, including light-force lethality and survivability enhancements.

We are modernizing the Legacy Force through recapitalization to sustain capabilities, reduce the cost of ownership, and extend the life of our legacy systems.

For the first time we have a clear definition: Recapitalization is defined as: "The rebuild and selected upgrade of currently fielded systems to ensure operational readiness and a zero time, zero mile system. The objectives include: (1) extend service life; (2) reduce O&S costs; (3) improve reliability, maintainability, safety, and efficiency; (4) enhance capability; and (5) reduce footprint on the battlefield." The Interim Force will seek the characteristics of the Objective Force within the constraints of available technology. In addition to IAVs integrated with "off the shelf" sensors and digitization, it will be equipped with lightweight artillery and other available technology.

Achieving Information and Decision Superiority

- Enablers
  - Information Operations Linked with Fires and Maneuver
  - Linked Strategic,Operational and Tactical Sensors and C4I
  - Web based, wide band networks
- Programs
  - Tactical Unmanned Aerial Vehicle (TUAV)
  - Joint Tactical Radio System (JTRS)
  - Joint Land Attack Cruise Missile Defense Elevated Netted Sensor (JLENS)
  - Unattended Ground Sensors
  - Warfighter Information Network – Tactical (WINN-T)

Army Cost Estimating Capabilities

Achieving Information and Decision Superiority

UNITS/FORCES	DEV.	PROC.	O&S
Legacy Systems	Good	Good	Good
Interim Force Systems	Good	Good	Fair
Objective Force Systems	Fair	Fair	Fair

Achieving Information and Decision Superiority Cost Research

- CEAC-5 Communications & Electronics Database
- CEAC-6 Sensor CER Development
- CEAC-1/2 OSMIS Database and Output Products
- CEAC-17 Unmanned Aerial Vehicle Data Collection & CER
- CEAC-18 COTS Electronics Model
- CEAC-19 Unmanned Ground Vehicles/Robotics Data Collection and CER
- CEAC-20 C^4ISR Cost-Performance Estimating Relationships

Striking with Precision

- Enablers
  - Increased Lethality at Extended Ranges
  - Constant, accurate common relevant operating picture
  - Direct Insertion Forces with Standoff Protection
  - Robust, Light Weight Anti-tank Capability
- Programs
  - Javelin
  - Land Warrior
  - Future Missiles

The uniform for the Future soldier must be lightweight and must provide increased protection from multiple threats.

Army Cost Estimating Capabilities
Striking with Precision

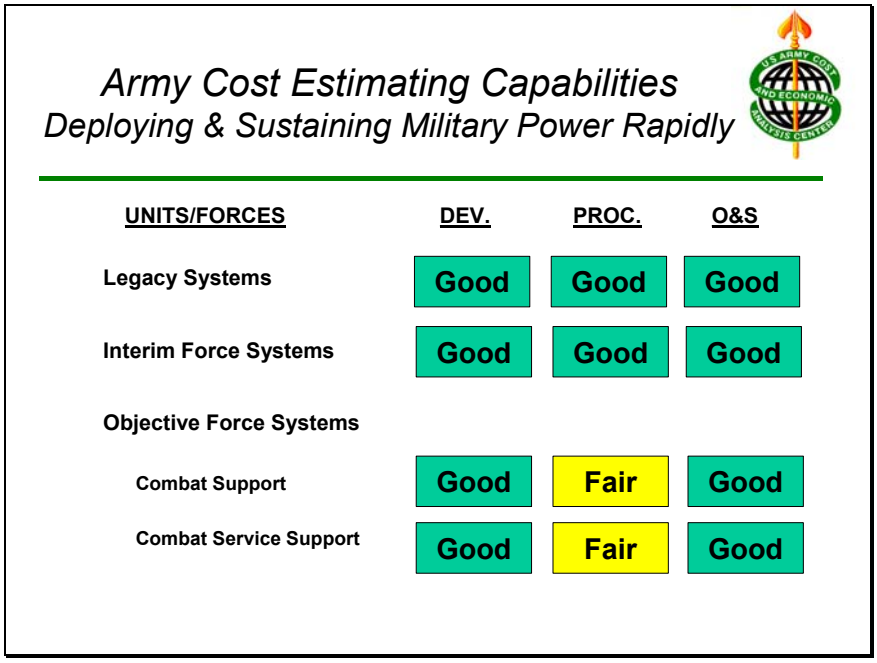
UNITS/FORCES	DEV.	PROC.	O&S
Legacy Systems	Good	Good	Good
Interim Force Systems	Good	Good	Good
Objective Force			
Missile Systems	Good	Fair	Good
Ammunition	Fair	Fair	Good

Striking with Precision
Cost Research

- CEAC-5 Communications & Electronics Database
- CEAC-6 Sensor CER Development
- CEAC-7 Army Tri-Service Missile and Munitions Database
- CEAC-1/2 OSMIS Database and Output Products
- CEAC-21 Missile Propulsion Cost Performance Estimating Relationships

Deploying and Sustaining Military Power Rapidly

- Enablers
  - Blend strategic supply and transportation functions
  - Integrate a system of network-centric logistics with strategic mobility capabilities
  - Direct link between management of items of supply and means of distribution
- Programs
  - Network Centric Logistics
  - Recapitalization programs
  - Future truck



RECAP PROGRAMS

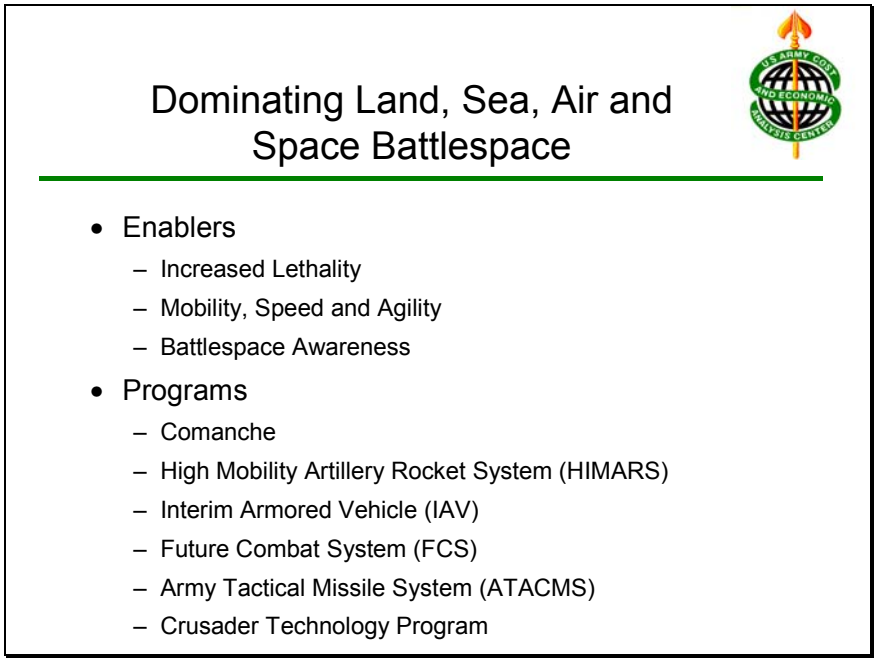
- Heavy Expanded Mobility Tactical Truck (HEMTT)
- M992 Field Artillery Ammunition Support Vehicle (FAASV)
- D-7F/G Dozer
- M973A1 Small Unit Support Vehicle
- M9 Armored Combat Earthmover (ACE)
- High Mobility Multipurpose Wheeled Vehicle (HMMWV)

FUTURE PROGRAMS

- Family of Medium Tactical Vehicles (FMTV)
- High Mobility Multipurpose Wheeled Vehicle (HMMWV) replacement

Deploying and Sustaining Military Power Rapidly Cost Research

- CEAC-1/2 OSMIS Database and Output Products
- CEAC-8 Wheel & Tracked Vehicle Database and Methodology Development
- CEAC-22 Hybrid Electric Vehicle Cost Performance Estimating Relationships



The Objective Force's Future Combat Systems' platform requirements for speed, mobility, deployability and survivability demand lighter weight, more robust, and better integrated multi-functional materials and structures.

Vehicle armor and personnel armor and equipment are too heavy and do not provide adequate protection against a broad threat spectrum (e.g., long-rod penetrators, bullets, fragmenting munitions, flechettes, blast, thermal, EM and NBC).

The digital battlefield adds new requirements for signature management and control that cannot be met by current technology.

Emerging materials science, computational mechanics, and modeling/simulation techniques are not being utilized to the fullest advantage to improve armor effectiveness and signature control while reducing weight, bulk, and cost.

Army Cost Estimating Capabilities
Dominating the Battlespace

UNITS/FORCES	DEV.	PROC.	O&S
Legacy Systems	Good	Good	Good
Interim Force Systems	Good	Fair	Fair
Objective Force			
Aviation Systems	Fair	Fair	Fair
Combat Vehicles	Poor	Poor	Poor
Missile Systems	Fair	Fair	Fair

Dominating Land, Sea, Air and Space Battlespace Cost Research

- CEAC-5 Communications & Electronics Database
- CEAC-6 Sensor CER Development
- CEAC-7 Army Tri-Service Missile and Munitions Database
- CEAC-8 Wheel & Tracked Vehicle Database and Methodology Development
- CEAC-9 Aircraft Module Database Development
- CEAC-1/2 OSMIS Database and Output Products
- CEAC-21 Missile Propulsion Cost Performance Estimating Relationships
- CEAC-22 Hybrid Electric Vehicle Cost Performance Estimating Relationships

Summary and Conclusions

- Objective Force systems
  - Characterized by limited system and technical descriptions
  - Requirements stated in terms of desired performance
  - Cost estimates are required earlier in a system's lifecycle
  - More alternatives are examined longer throughout the lifecycle
  - Capabilities developed as modular packages

Summary and Conclusions
(continued)

- Capability to estimate the cost of transformation is marginal overall
- Automated cost databases (ACDB) must be maintained
- Current research addressing needs of analysts
  - Data collection for parametric models
  - Top level CER
  - Performance based CER
  - CER incorporating technological advancement

X. Summary, Russell Vogel

Costing the Transformation: Summary

Russ Vogel
OSD CAIG Executive Secretary
May 23, 2002

Summary

- Different approaches to estimating/overlap of systems in each transformation initiative
- Minimal changes to traditional methods of estimating legacy systems
  - Earlier costing involvement (S&T/CTD)
- Areas needing emphasis
  - Transformational/Revolutionary systems
    - UAV/UUV/UCAV
    - Future Combat vehicles
    - High Speed Sealift/Joint Logistics over the shore ship
  - Evolutionary systems
    - Space Systems
    - C3I
    - MAIS
  - Procurement Cost Savings/Reduction Initiatives

Issues

- Costing to capabilities-based systems
  - Limited technical/programmatic/performance descriptions
- CARDs
  - Deletion/poor quality
  - "System Requirements Description"
- CCDR/SW Metric Reporting
  - Deletion/resistance of reporting requirement
  - Non-standardized/tailored
- Reduced estimating cycle time
  - 90 day ICEs/estimates

Appendix A.
Study Titles

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

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

PA&E–1	Force and Support Cost (FSC) System
PA&E–2	Visibility and Management of Operating and Support Costs (VAMOSC) for Major Weapon Systems
PA&E–3	O&M Program Balance and Related Cost Drivers
PA&E–4	Facilities Assessment Database (FAD)
PA&E–5	Selected Acquisition Report (SAR) Cost Variance Analysis
PA&E–6	Improved Cost Estimating Relationships for BMD Systems
PA&E–7	System Engineering and Integration Costs for Navy Combat Systems
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	Contractor Cost Data Reporting (CCDR) Clearinghouse/Repository
PA&E–12	Software Metrics and Major Cost Drivers
PA&E–13	Assessment of CCDR System
PA&E–14	Economic Drivers of Defense Overhead Costs
PA&E–15	Cost Behavior of C4I Systems
PA&E–16	CAIG Training Program

Missile Defense Agency

MDA–1	MDA Cost Risk Methodology Update (Revision 5)
MDA–2	Missile Development Engineering Cost Estimating Relationship
MDA–3	MDA Cost Breakdown Structure Update
MDA–4	Radar Cost Model
MDA–5	Integrating MDA Cost Risk Model with ACEIT
MDA–6	Target Common Cost Model
MDA–7	Deployable Optics Development and Manufacturing
MDA–8	Cost Improvement Slopes for Missile Acquisition Programs
MDA–9	The Cost Differential to Nuclear Harden MDA Systems

MDA–10 MDA Cost Research Symposium

Army Cost and Economic Analysis Center

CEAC–1 Operating and Support Management Information System (OSMIS) Data Base Management
CEAC–2 Operating and Support Management Information System (OSMIS) Output Products
CEAC–3 ACEIT Help-Desk/Training
CEAC–4 ACEIT Enhancements
CEAC–5 Communications and Electronics Cost Data Base
CEAC–6 Sensor Cost Estimating Relationship (CER) Development
CEAC–7 Army Tri-Service Missile and Smart Munitions Database
CEAC–8 Wheel and Tracked Vehicle Data Base and Methodology Development
CEAC–9 Aircraft Module Data Base Development
CEAC–10 Harvesting Standards
CEAC–11 Standard Variable Ids for use in ACEIT
CEAC–12 Tri-Service Missile and Smart Munitions Database Bluebook Update
CEAC–13 Installation Status Report (ISR) Part I, AIM-HI Cost Factors
CEAC–14 Installation Status Report (ISR) Standard Service Cost (SSC)
CEAC–15 Civilian Costing System
CEAC–16 Force and Contingency Cost Models Update
CEAC–17 Unmanned Aerial Vehicle Data Collection and CER
CEAC–18 COTS Electronics Database/Modeling
CEAC–19 Unmanned Ground Vehicles/Robotics Data Collection and CER
CEAC–20 C4ISR Cost-Performance Estimating Relationships
CEAC–21 Missile Propulsion Cost Performance Estimating Relationships
CEAC–22 Hybrid Electric Vehicle Cost Performance Estimating Relationships

Army Materiel Command

No input submitted.

Army Tank-automotive and Armaments Command

TACOM–1 Total Ownership Cost Reduction (TOCR) Model

Army Aviation and Missile Command

No input submitted.

Army Space and Strategic Defense Command

SMDC–1 Strategic Missile Model Update
SMDC–2 THAAD Radar Environmental Quality Life Cycle Cost Estimate (EQLCCE)
SMDC–3 PAC-3 Environmental Quality Life Cycle Cost Estimate (EQLCCE)

Naval Center for Cost Analysis

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

Office of Naval Research

ONR–1	Uncertainty Calculus to Minimize Total Ownership Costs for Ships
ONR–2	Affordability Measurement and Prediction Methods to Support Affordable Design of Ship Systems
ONR–3	Technology Insertion Cost Estimation Comparison for Aircraft Carrier Systems
ONR–4	Marine Composites Affordability—A Knowledgebased Approach
ONR–5	Composites Affordability Initiative Cost Analysis Tool (CAICAT)
ONR–6	The Effect of New Technologies on Ship Systems: A System Dynamics Cost Modeling Approach

Naval Air Systems Command

NAVAIR–1	Affordable Readiness Cost Model
NAVAIR–2	SLAP/SLEP Full Scale Testing Model
NAVAIR–3	Demilitarization/Disposal Model
NAVAIR–4	Cost Growth Analysis
NAVAIR–5	Naval Aircraft Modification Model (NAMM) Update
NAVAIR–6	Force Level Economic Effectiveness Trade (FLEET) Model
NAVAIR–7	Engineering Investigations Cost Model (EICM)
NAVAIR–8	Avionics Database

NAVAIR–9 Rotary Wing Database
NAVAIR–10 Propulsion Database
NAVAIR–11 Environmental Costs of Hazardous Operations (ECHO) Model
NAVAIR–12 Analysis of Alternatives (AOA) Evaluation Tool
NAVAIR–13 Missile Database
NAVAIR–14 Cost Risk Methodology/Model

Naval Sea Systems Command

NAVSEA–1 Material Vendor Survey
NAVSEA–2 Theater Surface Combatant (TSC) Technology Refresh Cost Model
NAVSEA–3 "System of Systems" Technology Refresh Cost Model

Naval Surface Warfare Center, Dahlgren Division

NSWCDD–1 Radar Cost Model
NSWCDD–2 Missile Cost Model Version 3.1

Naval Surface Warfare Center, Carderock Division

NSWCCD–1 Product-Oriented Design and Construction (PODAC) Cost Model
NSWCCD–2 LEAPS Cost Support
NSWCCD–3 Force Level Ship Environmental Cost Model

Air Force Cost Analysis Agency

AFCAA–1 ACE-IT/CO$TAT Enhancements
AFCAA–2 Military Aircraft Data and Retrieval (MACDAR) System Update
AFCAA–3 NAFCOM (NASA/Air Force Cost Model)
AFCAA–4 ACDB Missile Database Improvements
AFCAA–5 Air Force Total Ownership Cost (AFTOC) Management Information System
AFCAA–6 Air Force Inflation Model Tool
AFCAA–7 Aircraft Avionics Systems Database and Study
AFCAA–8 COTS Electronics Database/Modeling
AFCAA–9 Cost Factor Model Support
AFCAA–10 Analysis of Cost Growth using Selected Acquisition Reports
AFCAA–11 Missile and Munitions Sufficiency Review Handbook
AFCAA–12 Aircraft and Aircraft Modification Sufficiency Review Handbook
AFCAA–13 Long Range Planning Cost Analytical Support
AFCAA–14 Measuring ROI for R&M Investments
AFCAA–15 Automatic Update of AFI 65-503 with AFTOC database
AFCAA–16 Aircraft Software Data Track
AFCAA–17 COTS Ground Antennas System
AFCAA–18 USCM/PSCM Unmanned Space Cost Model and Passive Sensor Cost Models

AFCAA–19 Assessing Cost Reduction Initiatives and Returns on Investment for DoD Weapon System Programs
AFCAA–20 Aging Aircraft Study
AFCAA–21 Develop CPFH Contingency calibration factors

Aeronautical Systems Center, Air Force Materiel Command

ASC/FMC–1 Cost Communities of Practice (CoP) Portal
ASC/FMC–2 Aeronautical Industry Wrap Rate Study

Air Force Space and Missile Systems Center

No input submitted.

Electronics Systems Center, Air Force Material Command

No input submitted.

Ministry of Defence, Special Procurement Services/Cost Forecasting

PFG/CF–1 Software Support Cost Model Project (SSCMP)
PFG/CF–2 Software of Unknown Pedigree (SOUP) in Safety Critical Systems
PFG/CF–3 Family of advanced cost Estimating Tools (FACET) – Unmanned Air Vehicles & ground control elements
PFG/CF–4 Operating and Support Cost Analysis Model for Land fighting equipment (OSCAM-Land)
PFG/CF–5 Automated Cost Resource Evaluation and Data Integration Tool (A-CREDIT)
PFG/CF–6 Knowledge Assisted Cost Estimating Tool (KASCET) project
PFG/CF–7 Compensated Gross Tonnage (CGT) Factors in Naval Vessel Procurement
PFG/CF–8 Naval WLC Model
PFG/CF–9 Operating and Support Cost Analysis Model for Ship and Ship Systems (OSCAM-Ship & Ship Systems) - Data Sets

Air Force Institute of Technology

AFIT/ENV–1 In Search of Block Build Savings Within Satellite Programs
AFIT/ENV–2 Estimation Model for Cost Risk During the Engineering Phase of Acquisition Development
AFIT/ENV–3 An Analysis of the Implementation of Acquisition Reform Cost Initiatives and Program Cost Variance
AFIT/ENV–4 Developing Cost Pr Flying Hour Factors for Space Systems
AFIT/ENV–5 Integrating Cost as an Independent Variable (CAIV) Analysis with Evolutionary Acquisition for Command and Control (C2) Systems
AFIT/ENV–6 Assessing Procurement Cost Growth Via Historical Cost Variance Data

AFIT/ENV–7 An Analysis of the Federal Acquisition Streamlining Act and the Federal Acquisition Reform Act and Their Effect on Cost Overruns in ACAT I Acquisition Programs
AFIT/ENV–8 Evaluation of Software Cost Risk: A Look Beyond the Size Parameter
AFIT/ENV–9 A Comparative Analysis of the Cost Estimating Error Risk Associated with Flyaway Costs Verses Individual Components of Weapon Systems
AFIT/ENV–10 Establishing a Framework for the Measurement of Weapon Systems Value

Defense Systems Management College

No input submitted.

Aerospace Corporation

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

MITRE Corporation

MITRE–1 The Value of Return on Investment (ROI) Analysis to Non-Profit Organizations
MITRE–2 Public Sector Virtualization: Costs, Benefits and Risks

RAND Corporation

RAND–1 Turbine Engine Costs: A Primer and Cost Estimating Methodologies
RAND–2 Advanced Airframe Structural Materials Operating and Support Costs
RAND–3 Estimating Methodologies for Aircraft and Missile Testing Costs
RAND–4 Aircraft Support Cost Estimating Relationships
RAND–5 Aging Aircraft
RAND–6 Analysis of Cost Growth using Selected Acquisition Reports
RAND–7 Analysis of Systems Engineering/Program Management Costs

CNA Corporation

CNAC–1 Program Manager Education
CNAC–2 Acquisition Management Analysis
CNAC–3 Military Hospital Cost Analysis — Phase II
CNAC–4 Improving Metrics for Acquisition Management — Phase II
CNAC–5 Army Acquisition Management

Institute for Defense Analyses

IDA–1 Assessment of CCDR System
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	Economic Drivers of Defense Overhead Costs
IDA–6	Aircraft Production Capacity Analysis at the Plant Level
IDA–7	Affordable Multi-Missile Manufacturing (AM3)
IDA–8	Defense Economic Planning and Projection Systems (DEPPS)
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	Costs of Developing and Producing Next Generation Tactical Aircraft
IDA–15	Developing a Life Cycle Cost Model and Conducting a Cost Analysis of the Advanced Multifunction RF-Concept (AMRF-C)
IDA–16	Assessment of BMDO Cost Estimation Methodology and Cost Control/Cost Reduction Initiatives
IDA–17	Force Modernization Metrics
IDA–18	Active/Reserve Integration
IDA–19	Reducing Defense Infrastructure Costs
IDA–20	Management Headquarters Analysis
IDA–21	Workload Forecasting for the Veterans Benefits Administration
IDA–22	Evaluation of TRICARE Program Costs
IDA–23	Resource Analysis for Operational Test and Evaluation (OT&E)
IDA-24	Resource Analysis for Test and Evaluation—MRTFB
IDA–25	Resource Analyses for Technology Protection
IDA–26	Cost of Stealth
IDA–27	Costs & Benefits of Installation of Flight Safety Systems on F-22 Aircraft
IDA–28	Technical and Schedule Risk Assessments for Tactical Aircraft Programs
IDA–29	US-China Cooperation in Cost Analysis
IDA–30	FYDP Related Studies
IDA–31	FYDP Improvement, Phase II
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

Appendix B
Ongoing and Planned Research Study Summaries

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

At the end of each summary is a list of keywords the office or organization assigned to the study. (In some cases, keywords were modified for consistency.) These keywords were used in tabulating the numbers in Table B-1. The rows represent keywords and the columns represent offices and organizations. The number at the intersection of a row and column is the number of studies by the office or organization that have that keyword assigned to them.

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

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

Table B-1. Keyword Assignments

	PA&E	MDA	CEAC	TACOM	SMDC	NCCA	ONR	NAVAIR	NAVSEA	NSWCDD	NSWCCD	AFCAA	ASC/FMC	PEG/CF	AFIT/ENV	AERO	MITRE	RAND	CNA	IDA	Total
PERSPECTIVE																					
Industry	7	—	2	—	—	1	4	—	1	—	—	5	2	—	—	3	2	1	1	5	34
Government	14	10	19	—	—	14	4	3	2	2	3	21	1	9	10	3	—	6	3	29	153
CONTEXT																					
Estimating	13	3	19	—	3	10	5	6	3	2	3	12	2	7	—	3	1	4	—	15	111
Analysis	4	7	9	—	—	5	—	8	—	—	—	16	2	—	7	—	—	2	—	29	89
Reviewing/Monitoring	4	—	—	—	—	—	—	—	—	—	—	2	1	—	—	—	—	—	3	—	10
Policy	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	8	10
Programming	3	—	4	—	—	—	—	—	—	—	—	5	—	—	1	—	—	—	1	8	22
Budgeting	—	—	4	—	—	—	—	—	2	—	—	2	—	2	1	—	—	—	1	4	16
OBJECT																					
Forces	5	—	1	—	—	—	—	—	—	—	—	3	—	—	—	—	—	—	—	5	14
Weapon Systems	3	4	5	—	—	1	—	2	2	—	—	9	—	2	5	—	—	2	3	1	39
Aircraft	1	—	1	—	—	1	—	6	—	—	—	6	—	1	1	—	—	5	—	6	28
Helicopters	—	—	1	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	3
Missiles	1	3	3	—	3	—	—	1	—	1	—	7	—	—	—	—	—	1	—	4	24
Ships	—	—	—	—	—	4	5	—	3	—	3	—	—	3	—	—	—	—	—	—	18
Land Vehicles	—	—	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
Space Systems	—	—	—	—	—	—	—	—	—	—	—	2	—	—	2	3	—	—	—	1	8
Airframe	—	—	—	—	—	—	—	—	—	—	—	2	1	—	—	—	—	—	—	—	3
Propulsion	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	1	—	—	3
Electronics/Avionics	3	2	3	—	1	3	—	1	2	—	—	3	—	—	—	—	—	—	—	1	19
Spares/Logistics	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	2
Facilities	3	—	2	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	7
Infrastructure	—	—	2	—	—	2	—	—	—	—	—	2	—	—	—	—	2	—	—	6	14
Manpower/Personnel	—	—	1	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	4	7
STAGE																					
C&TD	—	—	8	—	—	—	4	—	—	—	—	—	—	—	—	2	2	—	—	—	16
SD&D	1	1	9	—	—	1	—	—	2	2	—	4	1	—	1	1	—	1	1	8	33
Production	3	1	11	—	—	3	2	—	2	2	—	6	1	1	1	—	—	1	1	10	45
Test and Evaluation	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	7	8
Operations and Support	—	1	5	—	—	6	3	—	2	—	—	4	—	2	1	—	—	4	—	6	33
Retirement and Demilitarization	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0
Life Cycle	1	4	5	—	—	2	3	—	—	—	1	7	—	3	6	3	—	—	—	7	42

(Continued on the next page.)

Table B-1—Continued

	PA&E	MDA	CEAC	TACOM	SMDC	NCCA	ONR	NAVAIR	NAVSEA	NSWCDD	NSWCCD	AFCAA	ASC/FMC	PFG/CF	AFIT/ENV	AERO	MITRE	RAND	CNA	IDA	Total
FOCUS																					
Labor	2	—	7	—	—	—	—	—	1	—	1	4	1	—	—	—	—	—	—	3	19
Material	2	—	3	—	—	—	1	—	2	—	1	4	—	—	—	—	—	—	—	2	15
Overhead/Indirect	5	—	6	—	—	—	—	—	—	—	1	1	1	—	—	—	—	—	—	5	19
Engineering	—	—	4	—	—	—	—	1	2	—	1	2	1	—	2	—	—	—	—	1	14
Manufacturing	—	2	9	—	—	1	—	—	—	—	1	4	1	1	1	—	—	1	—	1	20
CPR/CCDR	—	—	5	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	7
WBS	—	2	6	—	—	1	—	—	1	—	1	2	—	3	—	—	—	—	—	—	14
Fixed Costs	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	2
Variable Costs	—	—	—	—	—	—	—	—	—	—	—	3	—	—	—	—	—	—	—	2	5
Production Rate	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1
Acquisition Strategy	—	—	—	—	—	—	—	—	2	—	—	1	—	—	2	3	—	—	1	4	13
Automation	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	3
Advanced Technology	—	—	2	—	1	—	1	—	—	—	—	2	—	—	—	—	—	—	—	—	6
Risk/Uncertainty	—	2	—	—	—	2	3	1	2	—	—	5	—	—	—	1	—	—	—	1	15
Training	1	—	2	—	—	—	—	—	—	—	—	3	—	—	—	—	—	—	1	—	6
Readiness	—	—	2	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	2	5
Reliability	—	—	2	—	—	—	2	—	—	—	—	1	—	—	—	—	—	—	—	—	5
Sustainability	—	—	—	—	—	3	—	—	2	—	—	5	—	—	1	—	—	—	—	—	11
Integration	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	2
Modification	—	—	—	—	—	2	—	—	2	—	—	3	—	—	—	—	—	—	—	—	7
Security	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1
Environment	—	—	—	—	2	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	3
Schedule	3	—	—	—	—	2	—	—	—	—	—	1	—	—	—	—	—	—	—	5	11
Size	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Software	2	—	—	—	—	4	—	—	—	—	—	1	—	2	1	—	—	—	—	1	11
APPROACH																					
Data Collection	3	3	16	—	—	8	4	7	1	2	—	16	1	1	7	3	2	—	—	13	87
Survey	—	1	2	—	—	—	—	—	2	—	1	—	—	—	—	—	2	—	—	1	8
Case Study	—	—	—	—	—	1	—	—	—	—	1	—	—	—	—	—	2	—	—	2	6
Mathematical Modeling	3	2	10	—	—	3	—	—	1	—	—	5	—	2	—	3	—	—	—	8	37
Economic Analysis	2	—	—	1	—	—	—	—	1	—	—	—	—	2	—	—	—	—	1	5	12
Cost/Production Function	—	—	2	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	1	1	6
Time Series	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	2
Statistics/Regression	—	1	3	—	—	6	—	—	—	—	—	10	—	—	1	3	—	—	1	4	28

(Continued on the next page.)

Table B-1—Continued

	PA&E	*MDA*	*CEAC*	*TACOM*	*SMDC*	*NCCA*	*ONR*	*NAVAIR*	*NAVSEA*	*NSWCDD*	*NSWCCD*	*AFCAA*	*ASC/FMC*	*PFG/CF*	*AFIT/ENV*	*AERO*	*MITRE*	*RAND*	*CNA*	*IDA*	*Total*
PRODUCT																					
Database	1	—	11	—	—	12	—	4	2	—	—	15	1	1	—	—	—	—	2	12	61
Review	1	1	—	—	—	—	—	1	—	—	—	1	—	—	2	—	—	—	—	1	7
Method	—	—	—	—	1	4	—	3	—	—	1	2	—	—	1	—	2	2	—	8	24
Mathematical Model	1	—	1	—	—	—	1	3	—	2	3	3	—	5	4	—	—	—	—	1	24
Computer Model	1	2	7	—	—	—	—	1	1	—	—	8	—	—	—	3	1	—	—	6	30
Expert System	—	—	—	—	—	—	4	—	—	—	—	—	—	—	—	—	—	—	—	—	4
Cost Progress Curve	—	1	—	—	—	—	—	1	—	—	—	—	—	—	1	—	—	—	—	—	2
CER	3	3	5	—	—	6	1	2	1	1	—	10	—	—	1	3	—	2	—	—	38
Study	8	2	—	—	—	4	—	—	—	—	1	5	—	1	—	—	—	4	5	10	40

Program Analysis and Evaluation (PA&E)

Name:	Office of the Deputy Director (Resource Analysis), Program Analysis and Evaluation
Address:	OSD(PA&E) 1800 Defense Pentagon Washington, DC 20301-1800
Director:	Dr. David L. McNicol, (703) 695-0721
Size:	Professional: 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. We have started to develop our first infrastructure module, pertaining to installation support, which will support and improve indirect costing. A prototype installation cost module has been developed for the Army and is now being adapted for the Air Force.

Classification: Unclassified

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

LTC Terry Gerton, (703) 697-0221

Performer: UNISYS

Resources:

FY	*Dollars*	*Staff-years*
96	$170,000	
97	$200,000	
98	$275,000	
99	$365,000	
00	$375,000	
01	$385,000	
02	$300,000	

Schedule: *Start* *End*

Ongoing

Database: None

Publications: TBD

Keywords: Government, Estimating, Forces, Mathematical Model, 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:

FY	*Dollars*	*Staff-years*
96	$275,000	
97	$150,000	
98	$170,000	
99	$170,000	
00	$200,000	
01	$200,000	
02	$200,000	

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 (B)OS)/Real Property Maintenance (RPM).

Classification: Unclassified

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

Krysty Kolesar, (703) 697-0222

Performer: IDA

Resources:

FY	*Dollars*	*Staff-years*
00	$230,000	
01	$200,000	
02	$350,000	

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 will provide access to data necessary to assess and validate component planning, programming, and budgeting input as well as facilitate force and infrastructure analyses. FAD will link installation, personnel, and weapon systems data. A prototype FAD model has been delivered that provides detailed real property inventory data that supports facilities related cost modeling and analysis to include support for the Facilities Sustainment Model (FSM), the Facilities Aging Model (FAM), and the Force and Support Cost (FSC) System. The goals of the current phase are to expand it to include personnel data, weapon system inventory data, and RPM/BOS costs. This will require research of existing DoD databases to link historic to present infrastructure data such as DFAS' RPM/BOS execution data. Personnel and weapon system inventory data from each Service's authoritative databases will be incorporated to FAD.

Classification: Unclassified

Sponsor: OSD(PA&E)
The Pentagon, Rm. BE798
Washington, DC 20301

LTC Keith Kaspersen, (703) 695-7710

Performer: UNISYS

Resources:

FY	*Dollars*	*Staff-years*
99	$250,000	
00	$250,000	
01	$250,000	
02	$200,000	

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

Classification: Unclassified

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

John McCrillis, (703) 693-7828

Performer: NAVSHIPSO

Resources:

FY	*Dollars*	*Staff-years*
00	$215,000	
01	$215,000	
02	$211,000	

Schedule:

Start	*End*
Ongoing	

Database:

Title: SAR Cost Growth Database

Description: Collection of 130 MDAP programs with cost variances from SARs. Measurment 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: Improved Cost Estimating Relationships for BMD Systems

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

Classification: Unclassified

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

OAPPD
The Pentagon, Room BE829
Washington, DC 20301

Steve Miller (703) 692-8039

Performer: Technomics

Resources:

FY	*Dollars*	*Staff-years*
00	$50,000	
01	$100,000	
02	$100,000	

Schedule:

Start	*End*
Jan 99	Dec 03

Database: None

Publications: None

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

PA&E–7

Title: System Engineering and Integration Costs for Navy Combat Systems

Summary: This task, jointly sponsored by PA&E and NCCA, will collect information on the actual scope of effort and the cost experience for integrating Navy combat systems into Navy platforms. Cost estimating relationships for system engineering and integration costs will be developed for use in estimating costs for programs such as LPD-17, DD-X, LHA(R), and JCCX.

Classification: Unclassified

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

OAPPD
The Pentagon, Room BE829
Washington, DC 20301

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

Performer: Technomics

Resources:

FY	*Dollars*	*Staff-years*
01	$75,000	
02	$150,000	

Schedule:

Start	*End*
May 00	Dec 03

Database: None

Publications: None

Keywords: Industry, Estimating, Electronics/Avionics, Production, Data Collection, Mathematical Modeling, CER

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.

Classification: Unclassified

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

Brian Gladestone (703) 697-0319

Performer: LMI

Resources:

FY	*Dollars*	*Staff-years*
01	$100,000	
02	$200,000	

Schedule:

Start	*End*
Mar 01	Mar 03

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 2002 Symposium will focus on the status of the Military Departments' capabilities to estimate the costs of transformational 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:

FY	*Dollars*	*Staff-years*
00	$30,000 (PA&E share)	
01	$30,000 (PA&E share)	
02	$30,000 (PA&E share)	

Schedule:

Start	*End*
Oct 01	Sep 02

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: "2002 IDA Cost Research Symposium: Estimating the Cost of Tranformation," Stephen J. Balut et al., Document D-2727, Unclassified, August 2002

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

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:

FY	*Dollars*	*Staff-years*
01	100,000	

Schedule:

Start	*End*
May 02	

Database: TBD

Publications: None

Keywords: Government, Estimating, Analysis, Aircraft, Production, Data Collection, Mathematical Modeling, CER

PA&E–11

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

Summary: The DoD develops cost estimates of major weapon systems using historical data, the primary sources of which are the Contractor Cost Data Reports (CCDRs) provided by hundreds of defense contractors. CCDR data requirements have not been revised substantially since the system was established nearly two decades ago. In annual

meetings at IDA on cost research, the directors of the major DoD organizations that do defense cost research noted that the CCDR system had not been meeting their needs. Since then, steps have been taken to improve the usefulness of the CCDR system, to include analysis and reengineering of the system. This effort addresses additional steps that will further improve the utility of the CCDR system. This includes the ongoing transformation of the current CCDR repository into an automated cost information management system (ACIMS) that will allow users to locate and retrieve a variety of documents and data useful in estimating the entire life-cycle cost of a program. The ACIMS will query multiple sources, both internal and external to the current CCDR-PO system architecture, to find pertinent cost-related information on requested programs and return the results to users over secure Internet connections. The types of information that may be included in the ACIMS are operations and support cost data, technical performance data, cost research studies, cost growth information, cost estimating relationship databases, and libraries of cost information currently stored at various DoD cost activities.

Classification: Unclassified

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

Ron Lile, (703) 602-3301

Performer: VGS

Resources:

FY	*Dollars*	*Staff-years*
97	$150,000	
98	$220,000	
99	$ 75,000	
00	$230,000	
01	$510,000	
02	$865,000	

Schedule:

Start	*End*
Ongoing	

Database: None

Publications: None

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

FY	*Dollars*	*Staff-years*
02	$100,000	

Schedule:

Start	*End*
Oct 01	

Database: None

Publications: None

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

PA&E-13

Title: Assessment of CCDR System

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

During the past six years, the CCDR Project Office (CCDR-PO) has led an ongoing joint DoD and industry effort to re-engineer CCDR policies and business rules to improve the quality, relevancy, and availability of actual cost data. Significant progress has been made with the release of the CCDR Manual, changes to the DoD 5000.2-R, Mandatory Procedures for MDAPs and MAIS Acquisition Programs, revisions to the reporting formats, and deletion of the Plant-Wide Data Report requirement. While much has been done, several important areas still need to be addressed such as exploring alternative reporting approaches, assessing process activities, developing performance metrics, assessing contractor cost accounting practices, and assessing the effect of new reporting requirements for software projects.

Classification: Unclassified

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

Mr. Ron Lile (703) 602-3169

Performer: IDA
Mr. Jack Cloos (703) 845-2506

Resources:

FY	*Dollars*	*Staff-years*
FY01	$150,000	
FY02	$150,000	

Schedule:

Start	*End*
Oct 96	Feb 03

Database: None

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: OD(PA&E)
The Pentagon, Rm. BE799
Washington, DC 20301

Mr. Gary Pennett, (703) 695-7282

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

Resources:

FY	*Dollars*	*Staff-years*
95	$250,000	
96	$250,000	
00	$175,000	
02	150,000	

Schedule:

Start	*End*
Apr 95	Sep 02

Database: *Title:* IDA's Defense Contractor Overhead Database, Contractor Cost Data Reports

Automation: 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 C4I 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: OD(PA&E)
The Pentagon, Rm. BE799
Washington, DC 20301

Mr. Gary Pennett, (703) 695-7282

Performer: IDA

Resources:

FY	*Dollars*	*Staff-years*
02	$150,000	

Schedule:

Start	*End*
Jun 02	Sep 02

Database: None

Publications: None

Keywords: Industry, Government, Estimating, Electronics/Avionics, Software, Study

PA&E–16

Title: CAIG Training Program

Summary: Analysts assigned to the Office of the Secretary of Defense (OSD) 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 the CAIG have performed cost and resource analyses using the cost analysis practices that have been adopted by 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 the CAIG staff, in particular.

Classification: Unclassified

Sponsor: OSD(PA&E)
The Pentagon, Rm. BE799
Washington, DC 20301

Mr. Russ Vogel, (703) 695-2612

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

Resources:

FY	*Dollars*	*Staff-years*
02	$100,000	

Schedule:

Start	*End*
Jun 02	

Database: None

Publications: Classroom material/CDs

Keywords: 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) 697-3751 E-mail: janice.young@mda.osd.mil	
Size:	Professional: Support (w/Subs): Consultants: Subcontractors:	7 33 — 11
Focus:	MDA Cost Policy, Cost Estimating, Cost Analysis, Cost Research/Methodology Improvement, POM and Budget Support	
Activity:	Number of projects in process: Average duration of a project: Average number of staff members assigned to a project: Average number of staff-years expended per project: Percentage of effort conducted by consultants: Percentage of effort conducted by subcontractors:	6 9 months 1.5 1.4 0 20

MDA–1

Title: MDA Cost Risk Methodology Update (Revision 5)

Summary: The latest revision of the MDA Cost Risk Methodology incorporates a number of important methodological changes and an overall rewrite aimed at making the document easier to read and comprehend. Key methodology improvements include the incorporation of a new correlation technique to address below-the-line CBS items ("Historical Correlation") and revised Schedule/Technical scoring matrices. The previous *BMDO Cost Risk Procedures Manual* is incorporated into this revision as Chapter 4. This eliminates user need to maintain two volumes. This revision includes an appendix that addresses frequently asked questions.

Classification: Unclassified

Sponsor: MDA/PIE
Jan Young (703) 697-3751

Performer: Northrop Grumman IT/TASC, Inc.
Shawn Cobb, (703) 416-9500, Jessica Summerville, (703) 633-8300, Dick Coleman (703)633-8300

Resources:

FY	*Dollars*	*Staff-years*
01		1

Schedule:

Start	*End*
Nov 01	Jun 02

Database: *Description:* Database consists of historical SARs
Automation: Microsoft Excel and Crystal Ball

Publications: *MDA Cost Risk Methodology*

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 100th unit manufacturing cost, development time, development phase, and weight to predict the development engineering cost during the phase.

Classification: Unclassified

Sponsor: MDA/PIE
Jan Young (703) 697-3751

Performer: MCR Federal, Inc.
Zachary McGregor-Dorsey, Scott Vickers (703) 416-9500

Resources:

FY	*Dollars*	*Staff-years*
02		.6 FTE

Schedule:

Start	*End*
Jan 02	Jul 02

Database: *Description:* Database will consist of historical CCDRs

Publications: *Technical Notice,* TBP

Keywords: Government, Analysis, Estimating, Weapon Systems, Missile, SD&D

MDA–3

Title: MDA Cost Breakdown Structure Update

Summary: The MDA has radically changed its acquisition strategy and the previous version of the MDA Cost Breakdown Structure no longer fits that strategy. This update includes a revised CBS Structure, changes to CBS definitions, and a standardized format for reporting unit costs.

Classification: Unclassified

Sponsor: MDA/PIE
Jan Young (703) 697-3751

Performer: MCR Federal, Inc.
Scott Vickers, (703) 416-9500,

Resources:

FY	*Dollars*	*Staff-years*
02		1 FTE

Schedule:

Start	*End*
Apr 02	Indefinite

Database: None

Publications: *MDA Cost Breakdown Structure*, TBP

Keywords: Government, Weapons Systems, Life Cycle, WBS

MDA–4

Title: Radar Cost Model

Summary: The objective of this project is to build an automated Radar Cost Model that can be used to provide reasonably accurate quick turn around cost estimates for radar systems in support of architecture and trade studies. The initial model will consist of an Excel-based

module driven by existing CERs in the MDA Cost Research Library. The initial model will produce a complete cost estimate for radar, but may require knowledge of radar characteristics typically not known early in the development process. MDA will improve the model over time reducing the number of input variables through the application of input variable relationships, cost-to-cost relationships, and new CER development. As the model matures effort is shifted to improving the model host platform to make it more user friendly. Maintenance of the model will be a continuing effort once it is fully in place.

Classification: Unclassified

Sponsor: MDA/PIE
Jan Young (703) 697-3751

Performer: MCR Federal, Inc.
Kevin Cincotta, Scott Vickers (703) 416-9500

Resources:

FY	*Dollars*	*Staff-years*
02-03		3

Schedule:

Start	*End*
Nov 01	Nov 03

Database: *Description:* Various references from the MDA Cost Research Library.

Automation: Initially Microsoft Excel.

Publications: Technical Notices TBA

Keywords: Government, Analysis, Electronics/Avionics, Manufacturing, Operations and Support, Life Cycle, CER

MDA–5

Title: Integrating MDA Cost Risk Model with ACEIT

Summary: This project is intended to enable users of the MDA Cost Risk Methodology to perform the cost risk analysis using the ACE platform rather than a separate Excel platform. Initial experimentation used the RISK$ feature of ACE and demonstrated that the process is feasible, but requires an unacceptably high number of add on input variable lines in the estimate. Follow-on experimentation will explore using ACE-Exec as the host platform for running the risk methodology. Recommended procedures for running the MDA Cost Risk Methodology within the ACE platform will be published separately and later included in the FY 03 revision to the MDA Cost Risk Methodology Handbook.

Classification: Unclassified (proprietary)

Sponsor: MDA/PIE
Jan Young (703) 697-3751

Performer: Northrop Grumman IT/TASC, Inc.
Shawn Cobb (703) 416-9500,

Resources:

FY	*Dollars*	*Staff-years*
02		.5

Schedule:

Start	*End*
May 02	Oct 02

Database: *Automation:* ACE, ACE Exec, Crystal Ball, Microsoft Excel

Publications: *MDA Cost Risk Methodology Version 6*, TBP Mar 03

Keywords: Government, Analysis, Estimating, Weapon Systems, Life Cycle, Risk/Uncertainty, Mathematical Modeling, Computer Model

MDA–6

Title: Target Common Cost Model

Summary: The Target Common Cost Model will be a cooperative development effort between MDA/PIE, MDA/TE, and the Joint Targets Office. This project involves collecting cost and performance data for missile defense targets, developing a common Targets Cost Breakdown Structure (CBS), developing appropriate cost relationships for each CBS item, and developing an automated cost model. This model will enable users to develop quick, accurate estimates of target and range costs, to wargame alternatives, and plan budget requirements.

Classification: Unclassified (Proprietary)

Sponsor: MDA/PIE
Jan Young (703) 697-3751

Performer: MEVATEC
Chris Messick (703)416-9500
MCR Federal, Inc.
Scott Vickers (703) 416-9500

Resources:

FY	*Dollars*	*Staff-years*
02		1.0

Schedule:

Start	*End*
May 02	TBD

Database: TBD

Publications: TBD

Keywords: Government, Analysis, Missiles, Data Collection, WBS

MDA–7

Title: Deployable Optics Development and Manufacturing

Summary: This purpose of this study was to provide MDA analysts with a Cost Estimating Relationship (CER) for estimating the development and manufacturing cost of telescope mirrors in large optical telescope systems. The research team collected cost and performance data on 19 systems and developed a CER using density, number of optical segments, and Space/Ground indicator variable. The study provides factors that can be used to estimate below the line costs for systems that include large optical components.

Classification: Unclassified

Sponsor: MDA/PIE
Jan Young (703) 697-3751

Performer: MCR Federal, Inc.
Scott Vickers (703) 416-9500, Randal Caruthers (301)737-4600
MEVATEC
Chris Messick (703) 416-9500

Resources:

FY	*Dollars*	*Staff-years*
01		.75

Schedule:

Start	*End*
Sep 01	April 02

Database: None

Publications: *Deployable Optics Development and Manufacturing,* MCR, Technical Notice 02-03, April 2002

Keywords: Government, Analysis, Electronics/Avionics, Data Collection, CER, Study

MDA–8

Title: Cost Improvement Slopes for Missile Acquisition Programs

Summary: This study examined manufacturing costs for 23 missile production runs. The study develops best fitting curves for missile manufacturing using several approaches. The study provides the best fitting CAUC, Unit Theory, and Rate Adjusted Cost Improvement slopes individually for each system at the major component level and for the entire missile system. It groups the missiles into classes and develops best fitting curves by Mission Area class using each type of theory. The study examines production and deployment phase data by itself, then adds EMD manufacturing to provide estimates of step factors and best fitting slopes when EMD data is included. The study uses the model results to provide guidance to MDA analysts on how to select an appropriate cost improvement methodology for MDA cost estimates.

Classification: Unclassified (Proprietary)

Sponsor: MDA/PIE
Jan Young (703) 697-3751

Performer: MCR Federal, Inc.
Kevin Cincotta, Scott Vickers (703) 416-9500

Resources:

FY	*Dollars*	*Staff-years*
01-02		2.0

Schedule:

Start	*End*
Mar 01	Apr 02

Database: *Description:* CCDRs

Automation: None

Publications: *Cost Improvement Slopes for Missile Acquisition Programs*, Technical Notice 02-02, MCR Federal, Inc, April 2002

Keywords: Government, Analysis, Missiles, Production, Data Collection, Statistics/Regression, Cost Progress Curve

MDA–9

Title: The Cost Differential to Nuclear Harden MDA Systems

Summary: A large number of studies are available on this subject. The MDA study was a review of existing literature to identify and assemble the best of the available nuclear hardening methodologies and provide guidance on how to use them in MDA cost estimates. No new data or analytical methods are included in the final report.

Classification: Unclassified

Sponsor: MDA/PIE
Jan Young (703) 697-3751

Performer: MCR Federal, Inc.
Stephanie Casserlie (703) 506-4600, Scott Vickers (703) 416-9500,

Resources:

FY	*Dollars*	*Staff-years*
02		.25

Schedule:

Start	*End*
Dec 01	Mar 02

Database: References provided in TN 02-01

Publications: *The Cost Differential to Nuclear Harden MDA Systems*, Technical Notice 02-01, MCR Federal, Inc, March 02

Keywords: Government, Study

MDA–10

Title: MDA Cost Research Symposium

Summary: MDA conducts the 2nd annual Cost Research Symposium 14–15 November 2002 at the Fort Myer Community Club. The purpose of the symposium 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 symposium are extended to government organizations having an interest in missile defense cost analysis, the academic community, and support contractors.

Classification: Unclassified

Sponsor: MDA/PIE
Jan Young (703) 697-3751

Performer:

Resources:

FY	*Dollars*	*Staff-years*
02		

Schedule:

Start	*End*
Nov 02	Nov 02

Database: None

Publications: Symposium presentations will be available in Dec 02 on the MDA web site.

Keywords: Government, Survey, Review

Army Cost and Economic Analysis Center (CEAC)

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

Address: 1421 Jefferson Davis Highway, Suite 9000
Arlington, VA 22201-3259

Director: Mr. Robert Young; (703) 601-4200
DSN: 329-4200
FAX: (703) 601-4430

Size:

Professional:	52
Support:	9
Consultants:	0
Subcontractors:	1

Focus: The focus of the Army's Centrally Funded Cost Research Program is to improve the capability of the Army to develop cost estimates and economic analyses. The main categories of concentration are:

Data Base Development
Methodology Development
Costing the Effects of New Technology
Software Support Systems
PPBES Linkages

The Commodity areas we cover are:

Aircraft Systems
Missiles and Space Systems
Wheel and Tracked Combat Vehicle Systems
Communications and Electronics Systems
General Systems/Future Technology/Tools and Models
Information Management Systems
Force Unit Costing
Operating and Support Costing
Financial Management and Operations

Activity:

Number of projects in process:	22
Average duration of a project:	12 months
Average number of staff members assigned to a project:	1
Average number of staff-years expended per project:	.1
Percentage of effort conducted in-house:	5%
Percentage of effort conducted by consultants/contractors:	95%

CEAC–1

Title: Operating and Support Management Information System (OSMIS) Data Base Management

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

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

Classification: Unclassified

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

Performer: CALIBRE Systems, Inc.

Resources:

FY	*Dollars*	*Staff-years*
02		

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

CEAC–2

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

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

Classification: Unclassified

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

Performer: CALIBRE Systems, Inc.

Resources:

FY	*Dollars*	*Staff-years*
02		

Schedule:

Start	*End*

Ongoing

Database: OSMIS

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

Keywords: Government, Estimating, Programming, Budgeting, Weapon Systems, Operations & Support, Training, Readiness, Reliability, Data Collection, Database, Computer Model

CEAC–3

Title: ACEIT Help-Desk/Training

Summary: This project funds the Army portion of a joint Army/Air Force effort. The funding provides 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: US Army Cost and Economic Analysis Center
David Henningsen, (703) 601-4163/DSN 329-4163

Performer: Tecolote Research, Inc.

Resources:

FY	*Dollars*	*Staff-years*
02	$150,000	

Schedule:

Start	*End*
Ongoing	

Database: IBM PC Compatible

Publications: Tecolote ACE-IT Users Guide

Keywords: Government, Estimating

CEAC–4

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. Some of the most significant new features are "ACE session file locking, additional wizards, hidden rows, ACDB stored queries, ACDB automated factor generation and learning curve demonstration, ACE CAIV capability and better report generation capability. In addition, this project funds the web enabling of the Automated Cost Database (ACDB).

Classification: Unclassified

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

Performer: Tecolote Research, Inc.

Resources:

FY	*Dollars*	*Staff-years*
01	$530,000	
02	$235,000	

Schedule: *Start* *End*
Sept 01 Feb 03

Database: IBM PC Compatible

Publications: ACE-IT user manuals

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

CEAC–5

Title: Communications and Electronics Cost Database

Summary: Continue to develop a comprehensive Communications/Electronics(C/E) 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: US Army Cost and Economic Analysis Center
Sher Dhaliwal, (703) 601-4179/DSN 329-4179

Performer: Technomics, Inc.

Resources:

FY	*Dollars*	*Staff-years*
02	$240,000 [shared with CEAC-6]	

Schedule: *Start* *End*
Ongoing

Database: ACDB Foxpro database

Publications: Updated database on CD

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

CEAC–6

Title: Sensor Cost Estimating Relationship (CER) Development

Summary: This project will develop/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: US Army Cost and Economic Analysis Center
David Henningsen, (703) 601-4163/DSN 329-4163

Performer: Technomics, Inc.

Resources:

FY	*Dollars*	*Staff-years*
02	$240,000 [shared with CEAC-5]	

Schedule: *Start* *End*
Ongoing

Database: None

Publications: CD containing CER results and raw data

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

CEAC–7

Title: Army Tri-Service Missile and Smart Munitions Database

Summary: USACEAC developed a standard architecture for the acquisition of Weapon systems. USACEAC in conjunction with the Air Force and Navy Cost Communities has participated in the joint development and maturation of this Tri-Service database. The primary objective of this project is to collect missile cost data from CCDRs, CPRs, contracts or other sources that can be mapped and normalized to populate the Missile database. The database currently contains over 1000 raw missile cost records. The database contains technical and programmatic data and can be used to develop learning curves and cost factors.

Classification: Unclassified

Sponsor: US Army Cost and Economic Analysis Center

Betty Weber, (703) 601-4141/DSN 329-4141

Performer: Tecolote Research, Inc.

Resources:

FY	*Dollars*	*Staff-years*
01	$125,000	

Schedule: *Start* *End*
Ongoing

Database: ACDB Foxpro database

Publications: Updated database on CD

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

CEAC–8

Title: Wheel and Tracked Vehicle Data Base and Methodology Development

Summary: This project will provide USACEAC continued support in the development of a Wheeled and Tracked Vehicle Module (WTVM) for the Automated Cost Database (ACDB). Support will consist of data collection and analysis, data base evaluation and management.

Classification: Unclassified

Sponsor: US Army Cost and Economic Analysis Center

Tony Currie, (703) 601-4143/DSN 329-4143

Performer: Science Applications International Corporation (SAIC)

Resources:

FY	*Dollars*	*Staff-years*
01	$125,000	
02	TBD	

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

CEAC–9

Title: Aircraft Module Data Base 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: US Army Cost and Economic Analysis Center
Don Kehl, (703) 601-4140/DSN 329-4140

Performer: Ketron

Resources:

FY	*Dollars*	*Staff-years*
01	$125,000	
02	TBD	

Schedule: *Start* *End*
Ongoing

Database: ACDB FoxPro database

Publications: Updated database on CD

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

CEAC–10

Title: Harvesting Standards

Summary: This project will develop prototype ACEIT models for various commodity areas including missiles, vehicles and rotary wing aircraft. The project will demonstrate a standard means to interface to Engineering and/or effectiveness models.

Classification: Unclassified

Sponsor: US Army Cost and Economic Analysis Center
Ruth Johnson, (703) 601-4183/DSN 329-4183

Performer: Tecolote Research, Inc.

Resources:

FY	*Dollars*	*Staff-years*
01	$75,000	

Schedule:

Start	*End*
Ongoing	

Database: IBM PC Compatible

Publications: ACEIT/ACE Executive models

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

CEAC–11

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.

Classification: Unclassified

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

Performer: Inhouse

Resources:

FY	*Dollars*	*Staff-years*
TBD		

Schedule:

Start	*End*
May 02	

Database: None

Publications: Updated Army WBS incorporated into ACEIT

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

CEAC–12

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

Summary: USACEAC developed a standard architecture for the acquisition of Weapon systems. USACEAC in conjunction with the Air Force and Navy Cost Communities has participated in the joint development and maturation of this Tri-Service database. This effort will update the 1993 Missile Bluebook. The Bluebook is a detailed reference guide that includes factors and learning curves for the missile systems included in the ACDB.

Classification: Unclassified

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

Performer: Tecolote Research, Inc.

Resources:

FY	*Dollars*	*Staff-years*
02	$75,000	

Schedule:

Start	*End*
May 02	Dec 02

Database: None

Publications: 2002 Missile Bluebook (hardcopy and CD)

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

CEAC–13

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

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

Classification: Unclassified

Sponsor: US Army Cost and Economic Analysis Center
Steve Barth, (703) 601-4150/DSN 329-4150

Performer: Management Analysis Inc.

Resources:

FY	*Dollars*	*Staff-years*

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

CEAC–14

Title: Installation Status Report (ISR) 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: US Army Cost and Economic Analysis Center
Cecile Batchelor, (703) 601-4145/DSN 329-4145

Performer: Calibre Systems Inc.

Resources:

FY	*Dollars*	*Staff-years*

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

CEAC–15

Title: Personnel Costing System

Summary: The Personnel Costing System consists of two modules; 1) the Civilian Costing System (CCS) and Army Military-Civilian Cost System (AMCOS). The CCS is a model used to develop civilian personnel costs in support of PPBES. AMCOS is a model used to estimate military and civilian personnel costs in support of weapon systems acquisition

and various analytical studies. This project funds the update of the models with the latest rate data.

Classification: Unclassified

Sponsor: US Army Cost and Economic Analysis Center
Ralph Padgett, (703) 601-4148/DSN 329-4148

Performer: Calibre Systems Inc.

Resources:	*FY*	*Dollars*	*Staff-years*

Schedule:	*Start*	*End*
	Ongoing	

Database: IBM PC Compatible

Publications: None

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

CEAC–16

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: US Army Cost and Economic Analysis Center
Joe Gordon, (703) 601-4147/DSN 329-4147

Performer: Management Analysis Inc.

Resources:	*FY*	*Dollars*	*Staff-years*

Schedule:	*Start*	*End*
	Ongoing	

Database: IBM PC Compatible

Publications: None

Keywords: Government, Estimating, Forces, Operations & Support, Data Collection, Mathematical Modeling, Computer Model

CEAC–17

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: US Army Cost and Economic Analysis Center

David Henningsen, (703) 601-4163/DSN 329-4163

Performer: TBD

Resources:	*FY*	*Dollars*	*Staff-years*
	02	TBD	
Schedule:	*Start*	*End*	
	May 02	Jan 03	
Database:	None		
Publications:	None		
Keywords:	Government, Estimating, Aircraft, Production, Manufacturing, Data Collection, Mathematical Modeling, Cost/Production Function, CER		

CEAC–18

Title:	COTS Electronics Database/Modeling		
Summary:	In FY02 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 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. This effort will be performed under an Air Force Cost Analysis Agency (AFCAA) contract.		
Classification:	Unclassified		
Sponsor:	US Army Cost and Economic Analysis Center David Henningsen, (703) 601-4163/DSN 329-4163		
Performer:	Mission Research Corp. (MRC)		
Resources:	*FY*	*Dollars*	*Staff-years*
	02	$125,000	
Schedule:	*Start*	*End*	
	Jun 02		
Database:	Excel		
Publications:	Final Report		
Keywords:	Government, Estimating, Analysis, Life Cycle, Data Collection, Database, Mathematical Modeling, Statistics/Regression, CER, Computer Model		

CEAC–19

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:	US Army Cost and Economic Analysis Center David Henningsen, (703) 601-4163/DSN 329-4163		
Performer:	TBD		
Resources:	*FY*	*Dollars*	*Staff-years*
	02	TBD	
Schedule:	*Start*	*End*	

May 02 Jan 03

Database: None

Publications: Database and CER on CD

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

CEAC–20

Title: C^4ISR 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.

Classification: Unclassified

Sponsor: US Army Cost and Economic Analysis Center

David Henningsen, (703) 601-4163/DSN 329-4163

Performer: TBD

Resources:

FY	*Dollars*	*Staff-years*
02	TBD	

Schedule:

Start	*End*
June 02	

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

CEAC–21

Title: Missile Propulsion Cost Performance Estimating Relationships

Summary: The objective of this project is 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 will be collected to allow the use of commercial parametric cost estimating models. In is expected that the significant data on non-loitering propulsion units will also be collected under this task due to lack of historical data on loitering missiles. Develop CPER that will estimate prototype manufacturing and manufacturing costs for current and future systems.

Classification: Unclassified

Sponsor: US Army Cost and Economic Analysis Center

David Henningsen, (703) 601-4163/DSN 329-4163

Performer: Tecolote Research, Inc.

Resources:

FY	*Dollars*	*Staff-years*
02	TBD	

Schedule:

Start	*End*
June 02	Dec 02

Database: None

Publications: Database and CPER on CD

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

CEAC–22

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 Vehicles (HEV) concentrating on the drives. 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: US Army Cost and Economic Analysis Center

David Henningsen, (703) 601-4163/DSN 329-4163

Performer: TBD

Resources:

FY	*Dollars*	*Staff-years*
02	TBD	

Schedule:

Start	*End*
June 02	Jan 02

Database: None

Publications: Database and CPER on CD

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

Tank-automotive and Armaments Command (TACOM)

Name:	Cost & Systems Analysis U.S. Army Tank-automotive and Armaments Command	
Address:	AMSTA-CM-BV Warren, MI 48397-5000	
Director:	Richard S. Bazzy, (586) 574-6665; e-mail: bazzyr@tacom.army.mil	
Size:	Professional: Support: Consultants: Subcontractors:	50 2 0 0
Focus:	Responsible for the preparation of Program Office Estimates, Life Cycle Cost Estimates, and Economic Analyses. Perform cost validation to determine the reasonableness of cost estimates. Support the Earned Value Management Process. Develop cost models and databases along with performing cost research. Support is provided to combat, combat support, and combat service vehicle systems.	
Activity:	Number of projects in process: Average duration of a project: Average number of staff members assigned to a project: Percentage of effort conducted by consultants: Percentage of effort conducted by subcontractors:	25 3–20 weeks 1–3 0% 0%

TACOM–1

Title: Total Ownership Cost Reduction (TOCR) Model

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

Classification: Unclassified

Sponsor: U.S. Army Tank-automotive and Armaments Command
AMSTA-CM-BV

Richard Bazzy, (810) 574-6665

Performer: U.S. Army Tank-automotive and Armaments Command
AMSTA-CM-BV

Diane Hohn, (810) 574-6517

Resources:

FY	*Dollars*	*Staff-years*
00	$270,000	3.0

Schedule:

Start	*End*
Aug 99	Jul 00

Database: None

Publications: None

Keywords: Economic Analysis

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:	Mr. Jackson G. Calvert, Command Analysis Division (205) 955-3612	
Size:	Professional: Support: Consultants: Subcontractors:	15 2.5 Mavatech Corporation Tecolote Research, Inc., Computer Sciences Corp.
Focus:	Systems Costs, Component Cost Analyses, Economic Analyses	
Activity:	Number of projects in process: Average duration of a project: Average number of staff members assigned to a project: Average number of staff-years expended per project: Percentage of effort conducted by consultants: Percentage of effort conducted by subcontractors:	2 1 year 1 0.25 25% 50%

SMDC–1

Title: Strategic Missile Model Update

Summary: Since the origination of the Strategic Missile Model, a number of new cost estimating methodologies had been developed. An updated model that would apply to a number of missile systems (e.g., THAAD, MEADS, PAC-3) was desired. The primary objective of this task was to update and expand the list of available missile cost estimating relationships (CERs), refine the data in the missile module of the Army Cost Data Base (ACDB) so that it is ready for downloading to CO$STAT for CER development, develop new CERs or factors, and implement the selected CERs into ACEIT using the latest version of the ACE Information Manager (AIM).

Classification: Unclassified

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

Performer: Tecolote Research, Inc.

Resources:

FY	*Dollars*	*Staff-years*
01	$125,000	0.1

Schedule:

Start	*End*
Aug 00	Aug 01

Database: *Description:* DOD systems

Automation: Strategic and Theater Automated Research (STAR), ACE Information Manager (AIM)

Publications: USASMDC Ground Based Interceptor Model RDT&E Cost Estimating Relationships, CR-1124, September 2001. Attitude Control Systems/TMD Booster Cost Research (Update), CR-0798/1, September 2001. USASMDC Ground Based Interceptor Cost Model AIM Library, CR-1129, September 2001.

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

SMDC–2

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: Tecolote Research, Inc.

Resources:

FY	*Dollars*	*Staff-years*
01	$30,700	0.05

Schedule:

Start	*End*
Jul 01	Nov 01

Database: *Description:* DOD systems

Automation: Estimate is in ACEIT

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

Keyword: Estimating, Missiles, Environment

SMDC–3

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: Tecolote Research, Inc.

Resources:

FY	*Dollars*	*Staff-years*
02	$47,829	0.05

Schedule:

Start	*End*
Jan 02	Apr 02

Database: *Description:* DOD systems

Automation: Estimate will be in ACEIT

Publications: To be completed

Keywords: Estimating, Missiles, Environment

Naval Center for Cost Analysis (NCCA)

Name:	Naval Center for Cost Analysis (NCCA)
Address:	Nebraska Avenue Complex 4290 Mount Vernon Drive, NW, Suite 18200 Washington, DC 20393-5444
Director:	CAPT David Ziemba, USN Mr. Jack Smuck (Deputy Director) (202) 764-2430 (202) 764-2661
Size:	Professional: 33 civilian; 10 military Support: 3 civilian Consultants: Subcontractors:
Focus:	Naval Center for Cost Analysis (NCCA) is responsible for assisting (via IPTs) in the preparation of life cycle cost estimates for DoN weapon and automated information systems, managing the DoN VAMOSC Program and coordinating the DoN cost research program. The focus of the NCCA cost research program is the following: improved acquisition and operating and support (O&S) cost/technical data bases (e.g., VAMOSC, ACDB, etc.); improved methods for estimating direct and indirect O&S costs; improved methods for estimating software development/maintenance costs; improved methods for estimating specific E&MD cost elements, e.g., non-recurring engineering, system integration, government in-house support, etc.; methods for estimating the cost impact of acquisition reform initiatives.
Activity:	Number of projects in process: 15 Average duration of a project: 24 months Average number of staff members assigned to a project: 1 Average number of staff-years expended per project: 2 Percentage of effort conducted by consultants: 75% Percentage of effort conducted by subcontractors: 0

NCCA–1

Title Ship and Shipboard System Operating and Support Cost Analysis Model (OSCAM-Ship, OSCAM-Sys)

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

Classification: Unclassified

Sponsor: Naval Center for Cost Analysis
Nebraska Avenue Complex
4290 Mount Vernon Drive, NW, 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
Mr. Jeff Wolfe, NCCA, (202) 764-2671
Mr. Paul Wood, UK, 011 44 117 91 32686
Mr. Jonathan Coyle, UK, HVR CSL, 011 44 1420 87977

Resources:

FY	*Dollars*	*Staff-years*
96	UK$ only	1.0
97	UK$ only	1.5
98	$123,000 + UK$	0.75
99	$125,000 + UK$	0.5
00	$ 96,203 + UK$	0.5
01	$100,000 + UK$	0.5
02	$125,000 + UK$	0.5

Schedule:

Start	*End*	
Jan 97	Nov 97	Version 1 development
Dec 97	Feb 98	Version 2 development
Aug 98	Apr 99	Version 3 development
May 99	Apr 00	Version 4 development
Jun 00	Sep 01	Version 5 development
Dec 01	July 02	Version 6 development

Database: VAMOSC/other cost data and technical data

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

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

NCCA–2

Title: Aircraft Operating and Support Cost Analysis Model (OSCAM-Air)

Summary: This model is being developed using a "system dynamics" approach. This approach provides a structured methodology for dealing with complex systems having many interacting components. A system dynamics approach enables us to capture the dynamic behavior of a system while allowing for a flexible design that can be easily enhanced and expanded. Many questions posed today (e.g., How can the Navy reduce operating and support costs while maintaining readiness?) cannot be addressed with existing tools. The model will provide the flexibility for fast, top-level cost estimating, as well as the framework for analyzing possible policy decisions and their impact on cost and availability. Model outputs will include both cost and availability. The inclusion of availability within the model is crucial because cost reduction policies need to be analyzed in conjunction with their impact on availability, and vice versa.

Classification: Unclassified

Sponsor: Naval Center for Cost Analysis
Nebraska Avenue Complex
4290 Mount Vernon Drive, NW, 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.
Mr. Jeff Wolfe, NCCA, (202) 764-2671

Mr. Jonathan Coyle, UK, HVR CSL, 011 44 1420 87977

Resources:

FY	*Dollars*	*Staff-years*
99	$100,000 + UK$	0.75
00	$105,000	0.75
01	$106,000	0.5
02	$94,000	0.5

Schedule:

Start	*End*
Apr 99	Sep 99 (Prototype development)
Oct 99	Apr 00 (Version 1 development)
Jun 00	Sep 01 (Continuing development)
Dec 01	Nov 02 (Version 2 development)

Database: VAMOSC/other cost data and technical data

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

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

NCCA–3

Title: Advanced Amphibious Assault Vehicle (AAAV) Operating and Support Cost Analysis Model (OSCAM-AAAV)

Summary: This model was developed using a "system dynamics" approach. This approach provides a structured methodology for dealing with complex systems having many interacting components. A system dynamics approach enables us to capture the dynamic behavior of a system while allowing for a flexible design that can be easily enhanced and expanded. Many questions posed today (e.g., How can the Marine Corps reduce operating and support costs while maintaining readiness?) cannot be addressed with existing tools. The model will provide the flexibility for fast, top-level cost estimating, as well as the framework for analyzing possible policy decisions and their impact on cost and availability. Model outputs include both cost and availability. The inclusion of availability within the model is crucial because cost reduction policies need to be analyzed in conjunction with their impact on availability, and vice versa.

Classification: Unclassified

Sponsor: Direct Reporting Program Manager, AAAV
AAAV Technology Center
991 Annapolis Way
Woodbridge, Virginia 22191-1215

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Naval Center for Cost Analysis
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Ms. Wendy Kunc, (202) 764-2773

Performer: AAAV Program Office, NCCA in-house, and HVR Consulting Services, Ltd.
Mr. Jack Rothwell, AAAV DRPM, (703) 492-3346
Mr. Jeff Wolfe, NCCA, (202) 764-2671
Mr. Jonathan Coyle, UK, HVR CSL, 011 44 1420 87977

Resources:

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

Schedule:

Start	*End*
Apr 00	Sep 00 (Version 1 development)
Oct 00	Sep 01 (Continued enhancements)
Oct 01	Sep 02 (Version 2 development)

Database: VAMOSC/other cost data and technical data

Publications: Supporting documentation available on website, www.oscamtools.com.

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

NCCA–4

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.

Classification: Unclassified

Sponsor: Naval Center for Cost Analysis
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Performer: NCCA in-house, PwC Consulting of PricewaterhouseCoopers LLP
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Ms. Colleen Adamson, Ships and Shipboard Systems Lead, (202) 764-2606
LCDR Donna Sullivan, Weapons and USMC Lead, (202) 764-2637
LT Greg Pederson, Aviation Lead, (202) 764-2676
Mr. Don Clarke, IT Lead, (202) 764-2883
Mr. Al Leung, PwC Consulting, (703) 633-4305

Resources:

FY	*Dollars*	*Staff-years*
00	$2,800,000	5
01	$2,035,000	5
02	$2,615,000	5

Schedule:

Start	*End*
FY 99	continuing

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

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

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

NCCA–5

Title: Cost of Manpower Estimating Tool (COMET v2.0)

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

Classification: Unclassified

Sponsor: Naval Center for Cost Analysis
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Ms. Wendy Kunc, (202) 764-2773

Performer: NCCA in-house

LCDR Donna Sullivan, (202) 764-2637

Classification: Unclassified

Resources:

FY	*Dollars*	*Staff-years*
97	$119,000	0.1
98	$77,000	0.25
99	$75,000	0.25
00	$75,000	0.50
01	$100,000	0.5
02	$0	0.5

Schedule:

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

Database: Revised Navy Billet Cost Factors/Model

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

Keywords: Infrastructure, Study, Government, Manpower/Personnel

NCCA–6

Title: Navy Obligations Data Extraction System (NODES)

Summary: NODES is a detailed, fully integrated, total operating and support cost database that complements the direct costs in VAMOSC. NODES includes all costs in the OMN and MPN appropriations and is consistent with Navy programming, budgeting, and accounting systems. NODES will be enhanced to include more appropriations, more detail and better linkage between indirect costs and weapon systems.

Classification: Unclassified

Sponsor: Naval Center for Cost Analysis
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Washington, DC 20393-5444

Ms. Wendy Kunc, (202) 764-2773

Performer: NCCA in-house

LCDR Donna Sullivan, (202) 764-2637

Resources:

FY	*Dollars*	*Staff-years*
96	$300,000	0.1
97	$85,000	0.1
98	$85,000	0.3
99	$200,000	0.3
00	$200,000	2.0
01	$150,000	1.5
02	$100,000	0.5

Schedule:

Start	*End*
FY96	Continuing
FY01	FY02 (Created Ships Maintenance Module)

Database: Navy Obligations Data Extraction System in MS Access

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

Keywords: Infrastructure

NCCA–7

Title: COTS Shipboard Electronics Cost Factors

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

Classification: Unclassified

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

Mr. Jack Smuck, (202) 764-2661

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

Resources:

FY	*Dollars*	*Staff-years*
00	165K	

Schedule:

Start	*End*
Sep 00	Sep 02

Database: Raw and normalized COTS and MILSPEC data

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

Keywords: Government, Estimating, Ships, Production, Modification, Case study, Database

NCCA–8

Title: Platform Integration Cost Database/Model for Shipboard Electronics

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

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

Sponsor: Naval Center for Cost Analysis
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Washington, DC 20393-5444

Mr. Jack Smuck, (202) 764-2661

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

Resources:

FY	*Dollars*	*Staff-years*
00	325K	
01	75K	

Schedule:

Start	*End*	
Phase I	Sep 00	Jun 02
Phase II	TBD	TBD
Phase III	TBD	TBD

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, Production, Operations and Support, Integration, Modification, WBS, Data Collection, Database

NCCA–9

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).

Classification: Cost Data: Business Sensitive
Technical Characteristics: Unclassified

Sponsor: Naval Center for Cost Analysis (NCCA)

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Washington, DC 20393-5444

Mr. Jack Smuck, (202) 764-2661

Performer: Tecolote Research, Inc.

Resources:

FY	*Dollars*	*Staff-years*
00	300K	

Schedule:

Start	*End*
Sep 00	Complete

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

NCCA–10

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: Naval Center for Cost Analysis
Nebraska Avenue Complex
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Mrs. Cheri E. Cummings, (202) 764-2662

Performer: NCCA in-house and Upper Mohawk, Inc.
Ms. Pamela L. Johnson, NCCA, (202) 764-2685
Mr. Mike Tran, NCCA, (202) 764-2496
Mr. William Brundick, (717) 993-3501

Resources:

FY	*Dollars*	*Staff-years*
00	$274,226	

Schedule:

Start	*End*
Oct 00	Mar 02

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

NCCA–11

Title: Weapon System Software Development Estimating Methodology

Summary: This effort will entail maintaining/updating the NCCA software effort, schedule, labor rate, and SLOC growth estimating methodologies developed for the NCCA *Software Development Estimating Phase One Handbook*. Effort will include updating the current software development estimating tools and documenting the results. Additionally, effort will target the identification and assessment of commercially available software development estimating methodologies.

Classification: Unclassified

Sponsor: Naval Center for Cost Analysis
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Mrs. Cheri E. Cummings, (202) 764-2662

Performer: NCCA in-house
Ms. Pamela L. Johnson, (202) 764-2685
Mr. Mike Tran (202) 764-2496

Resources:

FY	*Dollars*	*Staff-years*
02	TBD	1

Schedule:

Start	*End*
TBD	TBD

Database: TBD

Publications: Update of the NCCA *Software Development Estimating Handbook – Phase I*

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

NCCA–12

Title: Weapon System Software Maintenance Cost/Technical Database and Estimating Methodology

Summary: Software maintenance metrics and cost data are being collected on a variety of weapon systems, primarily shipboard electronic systems. Newly collected data will focus on avionics and aircraft software. This data will be used to develop software maintenance arrival/closure distribution curves and cost estimating relationships/factors. This effort is a continuation of the NSWCDD project entitled, "Software Maintenance Cost Process Model."

Classification: Unclassified

Sponsor: Naval Center for Cost Analysis
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Ms. Jennifer Echard (202) 764-2689
Mr. Brian Octeau, Technomics (703) 415- 7505
Mr. Jason Lee, Technomics (703) 415-1007

Resources:

FY	*Dollars*	*Staff-years*
96	$74,000	0.1
97	$50,000	0.1
98	$100,000	0.1
99	$0	0.15
00	$182,400	1.2

Schedule:

Start	*End*
Feb 96	Feb 03

Database: TBD

Publications: TBD

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

NCCA–13

Title: AIS Life Cycle Cost and Technical Database

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

Classification: Unclassified

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

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

Resources:

FY	*Dollars*	*Staff-years*
00	$98,900	1.0

Schedule:

Start	*End*
Oct 00	Apr 02

Database: TBD

Publications: TBD

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

NCCA–14

Title: Hardware Deflator Methodology

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

Classification: Unclassified

Sponsor: Naval Center for Cost Analysis
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Mr. Jeff Cherwonik, Technomics, (703) 415-1006
Mr. Jason Lee, Technomics (703) 415-1007

Resources:

FY	*Dollars*	*Staff-years*
00	$68,668	0.4

Schedule:

Start	*End*
Oct 00	Feb 03

Database: TBD

Publications: TBD

Keywords: Government, Estimating, Data Collection, Database

NCCA–15

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

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

Classification: Unclassified

Sponsor: Naval Center for Cost Analysis
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Washington, DC 20393-5444
Ms. Cheri Cummings, (202) 764-2662

Performer: NCCA in-house
Ms. Pamela Johnson, NCCA, (202) 764-2685

Resources:

FY	*Dollars*	*Staff-years*
02	$0	0.5

Schedule:

Start	*End*
May 02	Oct 02

Database: AIS Software Development and Maintenance Cost/Technical Databases

Publications: TBD

Keywords: Government, Estimating, SD&D, Operations and Support, Software, Statistics/Regression, Method, CER

Office of Naval Research (ONR)

Name:	Office of Naval Research (ONR)
Address:	800 N. Quincy Street Arlington, VA 22217
Director:	Dr. Steve Ramberg
Focus:	Research in Cost Analysis Methods
Activity:	Number of projects in process: 6 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 a Technology Insertion model, and the development of a Geometry Cost Evaluation model. The research methods include data finding and knowledge elicitation, model construction using uncertainty calculus, and model validation/verification. This provides results immediately available to Navy program managers in the DD-21, NSSN, and LPD-17 programs with transition to other programs possible.

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

Sponsor: Office of Naval Research
800 North Quincy Street
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Ms. Katherine Drew
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Performers:

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PO Box 10348
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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*:**

FY	*Dollars*	*Staff-years*
1999	$ 246K *	
2000	$ 34K *	
2001	$ 34K *	
2002	$ 68K	

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

***Schedule*:** *Start* *End*
May 15, 1999 30 September, 2003

Database: None

***Publications*:** Public Domain as appropriate

Keywords: Government, Estimating, Ships, C&TD, Life Cycle, Risk/Uncertainty, Data Collection, Expert System

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, VAMOSEC, 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

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Ingalls Shipbuilding
PO Box 149
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Mr. J. D. Philo
(228) 935-5225

***Resources*:**

FY	*Dollars*	*Staff-years*	
1999	$ 70K		STTR Phase I
2000	$ 30K		STTR Phase 1, Option
2000	$100K		STTR Phase II
2001	$ 200K		STTR Phase II
2002	$ 100K		STTR Phase II
2002	$ 50K		STTR Phase II, Option
2003	$ 50K		STTR Phase II, Option

***Schedule*:**

Start	*End*	
June 1, 1999	November 30, 1999	STTR Phase I
Feb. 24, 2000	May 23, 2000	STTR Phase I, Option
July 27, 2000	July 26, 2002	STTR Phase I
July 27, 2002	July 26, 2003	STTR Phase II, Option

Publications:

Phase I:

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

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

Phase II:

Publications in the public domain are pending

Keywords:

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

ONR–3

***Title*:**

Technology Insertion Cost Estimation Comparison for Aircraft Carrier Systems

***Summary*:**

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

Significant participation by Newport News Shipbuilding and limited participation by NAVSEA is included.

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

Sponsor: Office of Naval Research
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Naval Sea Systems Command (SEA 0176)
2531 Jefferson Davis Highway
Arlington, VA 22242

Mr. Irvin Chewning
(703) 415-4815

***Resources*:**

FY	*Dollars*	*Staff-years*
2000	$ 164K	
2001	$ 241K	
2002	$ 77K	

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

***Schedule*:**

Start	*End*
Feb. 17,2000	December 31, 2002

***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, and NSWC Carderock.

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

Sponsor: Office of Naval Research
800 North Quincy Street
Arlington, VA 22217-5600
Ms. Katherine Drew, (703) 696-5992

Performer:

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

Dr. H. Dwayne Jerro
(318) 257-2259

Northrop Gruman Corp.
Ship Systems Avondale
Operations
PO Box 50280
New Orleans, LA 70150

Mr. John White, (504) 437-3328

NSWC Carderock
9500 MacArthur Blvd.
West Bethesda, MD 20817

Dr. Milton Critchfield
(301) 227-1769

University of New Orleans
913 Engineering Building
New Orleans, LA 70148

Dr. Alley C. Butler, PE, (504) 468-6339

***Resources*:**

FY	*Dollars*	*Staff-years*
2000	$ 100K	
2001	$ 56K	
2002	$ 149K	
2003	$ 68K	
2004	$ 84K	

* in-kind contribution from Louisiana Tech University total $ 15K,
and an in-kind contribution from Avondale Industries of $ 56K, Carderock $147.5K

***Schedule*:**

Start	*End*
Aug 17, 2000	September 30, 2003

***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, Composite Materials

ONR–5

Title: Composites Affordability Initiative Cost Analysis Tool (CAICAT)

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

Classification: Unclassified

Sponsors:

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

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

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

Resources:

FY	*Dollars*
1998–2000	$3.1 M (50-50 Cost Share by Government-Industry)

Publication: Quarterly Reports, SAMPE publication

Keywords: Process Based Estimating, CER, Computer Software, Airframe Structures

ONR–6

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

Summary: The introduction of new technologies often causes a temporary loss of productivity and leads to additional unforeseen costs over a system's life cycle. One of the reasons for this productivity degradation is that traditional systems engineering management fails to plan for the effects of technology procurement, implementation, and maintenance. The success of introducing new technologies for ship systems requires a high level of initial planning and cooperation among the customers (in this case the fleet), the suppliers (in this case the shipbuilder), and the government procurement organization. The capability of the technology, the skills of the users of the technology, and the ship system structure and performance must be collectively evaluated and reconfigured to determine the best operational environment for the new technology. Establishing this operational environment will determine the affordability of future ship systems. This research defines the problem of introducing new technologies for ship systems and outlines how ship system performance can be predicted, evaluated, and controlled using a system dynamics (SD) modeling approach with an embedded optimization routine called Data Envelopment Analysis.

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

Ms. Katherine Drew, (703) 696-5992 (voice); (703) 696-4884 (fax)

Performer: Virginia Tech
Department of Industrial and Systems Engineering
System Performance Laboratory
Dr. Kostas Triantis, Principal Investigator (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)
2531 Jefferson Davis Highway
Arlington, VA 22242

Mr. Irwin Chewning, (703) 415-4815

Resources:

Year	*Dollars*	*Staff-years*
2000	$103K	
2001	$192K	
2002	$ 75K	
2003	$ 71K	

Schedule:

Start	*End*
May 2000	April 30, 2003

Database: VAMOSC and other cost and technical data.

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

Vaneman, W. and Tiantis, K. "Planning for Technology Implementation: An SD (DEA) Approach", *Proceedings of the Portland International Conference on Management of Engineering and Technology, July, 2001, Portland, Oregon.*

W. Vaneman and K. Triantis "The Dynamic Production Axioms and System Dynamics Behaviors: The Foundation for Future Integration" accepted with revisions, *Journal of Productivity Analysis.*

Monga, P. "A System Dynamics Model of the Development of New Technologies for Ship Systems Pavinder Monga, MS Thesis, Virginia Tech, 2001.

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

Naval Air Systems Command (NAVAIR)

Name:	Naval Air Systems Command Headquarters
Address:	Cost Department (AIR-4.2) 21491 Great Mills Rd. Lexington Park, MD 20653
Director:	Dave Burgess (301) 757-7810 Website: http://www.navair.navy.mil/air40/air42/
Size:	Professional: 198 NAVAIR HQ/NAWC-PAX 168 NAWC-AD-LAKE 18 NAWC-WD-CL 12
Focus:	The Cost Department provides a wide variety of cost analysis products and services. The department's primary focus is to provide a clear and comprehensive understanding of life cycle cost and attendant uncertainties to be used in developing, acquiring, and supporting affordable Naval Aviation Systems. Besides life cycle cost estimates, the Cost Department provides source selection cost evaluation support, earned value management analysis, cost research, databases and various cost/benefit studies. The focus of NAVAIR cost research is: Total Ownership Cost initiatives; cost growth; modifications; cost/benefits; engineering investigations, and building comprehensive databases.
Activity:	Number of projects in process: 9 Average duration of a project: 1 year Average number of staff members assigned to a project: 1-2 Average number of staff-years expended per project: 1-2 Percentage of effort conducted by consultants: 50% Percentage of effort conducted by subcontractors: 0%

NAVAIR–1

Title: Affordable Readiness Cost Model

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

- Reliability
- Maintainability
- Obsolescence
- Depot
- General

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

Classification: Unclassified

Sponsor: Naval Air Systems Command
21491 Great Mills Rd.
Lexington Park, MD 20653

Performer: Ketron

Resources:

FY	*Dollars*	*Staff-years*
99	$285,000	

Schedule:

Start	*End*
May 99	Jan 00

Database: None

Publication: Technical Report

Keywords: Estimating, Analysis, Method, Data Collection, CER, Computer Model

NAVAIR–2

Title: SLAP/SLEP Full Scale Testing Model

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

Classification: Unclassified

Sponsor: Naval Air Systems Command
21491 Great Mills Rd.
Lexington Park, MD 20653

Performer: Tecolote

Resources:

FY	*Dollars*	*Staff-years*
99	$50,000	

Schedule:

Start	*End*
May 99	Jan 00

Database: None

Publication: Technical Report

Keywords: Estimating, Analysis, Method, Data Collection, Mathematical Model

NAVAIR–3

Title: Demilitarization/Disposal Model

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

Classification: Unclassified

Sponsor: Naval Air Systems Command
21491 Great Mills Rd.
Lexington Park, MD 20653

Performer: Naval Air Warfare Center—Aircraft Division
Lakehurst, New Jersey

Resources:

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

Schedule:

Start	*End*
May 99	Mar 00

Database: None

Publication: Technical Report

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

NAVAIR–4

Title: Cost Growth Analysis

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

Classification Unclassified

Sponsor: Naval Air Systems Command
21491 Great Mills Rd.
Lexington Park, MD 20653

Performer: NAVAIR and Northrop Grumman/TASC

Resources:

FY	*Dollars*	*Staff-years*
00	$69,000	.5
01	$30,000	.2
02	$45,000	.3

Schedule:

Start	*End*
Mar 00	Oct 02

Database:

Title:	NAVAIR Cost Growth Database
Description:	NAVAIR aircraft, weapons, and avionics programs cost growth in Excel spreadsheets
Automation:	TBD

Publication: Technical Report

Keywords: Aircraft, Weapon Systems

NAVAIR–5

Title: Naval Aircraft Modification Model (NAMM) Update

Summary: The task is to expand the coverage, functionality and usefulness of the existing NAMM database. Additional OSIP and modifications program data will be collected, normalized, and incorporated into the existing database of technical characteristics and program descriptions.

Classification: Unclassified

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

Performer: MCR Federal

Resources:

FY	*Dollars*	*Staff-years*
00	$74,101	.75

Schedule:

Start	*End*
Dec 99	Aug 00

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

NAVAIR–6

Title: Force Level Economic Effectiveness Trade (FLEET) Model

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

Classification: Unclassified

Sponsor: Naval Air Systems Command
21491 Great Mills Rd.
Lexington Park, MD 20653

Performer: Tecolote

Resources:

FY	*Dollars*	*Staff-years*
00	$70,000	.5
01	$100,000	.8
02	$50,000	.3
03	TBD	TBD

Schedule:

Start	*End*
Apr 00	Apr 03

Database: None

Publication: Technical Report, Model

Keywords: Estimating, Analysis, Aircraft

NAVAIR–7

Title: Engineering Investigations Cost Model (EICM)

Summary: The Engineering Investigation Cost Model (EICM) provides Fleet Support Teams (FST) with a tool to evaluate the cost and potential cost avoidance of performing a routine engineering investigation. The EICM allows users to assess the economic merits of conducting an EI on an aircraft subsystem, support equipment item, or weapon. Based on a minimum number of required data inputs, the model allows FST members to estimate

the initial cost of conducting the EI, to determine the potential cost avoidance associated with fixing the problem item, and to calculate the maximum remedial action investment available while still generating a return on investment (ROI) of 5 to 1.

Classification: Unclassified

Sponsor: Naval Air Systems Command
21491 Great Mills Rd.
Lexington Park, MD 20653

Performer: Ketron

Resources:

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

Schedule:

Start	*End*
Apr 99	Jul 00

Database: None

Publication: Technical Report, Model

Keywords: Analysis, Aircraft, Engineering, Mathematical Model

NAVAIR–8

Title: Avionics Database

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

Classification Unclassified

Sponsor: Naval Air Systems Command
21491 Great Mills Rd.
Lexington Park, MD 20653

Performer: Naval Air Systems Command
21491 Great Mills Rd.
Lexington Park, MD 20653

Resources:

FY	*Dollars*	*Staff-years*
00	$100,000	.75
01	$100,000	.75
02	$100,000	.75
03	$100,000	.75

Schedule:

Start	*End*
Dec 99	Jul 03

Database:

Title: Avionics Database

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

Automation: TBD

Publication: Technical Report—Database Documentation

Keywords: Data Collection, Electronics/Avionics, Database

NAVAIR–9

Title: Rotary Wing Database

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

Classification Unclassified

Sponsor: Naval Air Systems Command
21491 Great Mills Rd.
Lexington Park, MD 20653

Performer: Naval Air Systems Command
21491 Great Mills Rd.
Lexington Park, MD 20653

Resources:

FY	*Dollars*	*Staff-years*
00	$100,000	.75
01	$50,000	.3
02	$100,000	.75
03	$100,000	.75

Schedule:

Start	*End*
Dec 99	Jul 02

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: Data Collection, Helicopters, Database

NAVAIR–10

Title: Propulsion Database

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

Classification Unclassified

Sponsor: Naval Air Systems Command
21491 Great Mills Rd.
Lexington Park, MD 20653

Performer: Naval Air Systems Command
21491 Great Mills Rd.
Lexington Park, MD 20653

Resources:

FY	*Dollars*	*Staff-years*
00	$100,000	.75
01	$30,000	.2
02	$50,000	.4

Schedule:

Start	*End*
Dec 99	June 02

Database: *Title:* Propulsion Database

Description: Cost, technical, and programmatic data for historical propulsion programs.

Automation: TBD

Publication: Technical Report—Database Documentation

Keywords: Data Collection, Aircraft, Database

NAVAIR–11

Title: Environmental Costs of Hazardous Operations (ECHO) Model

Summary: Perform a verification/validation of the ECHO model, which was developed by Tecolote. The model calculates the environmental costs incurred throughout the life cycle of a program. Costs include hazardous material purchase; hazardous material tracking, handling and storage; hazardous waste disposal; hazardous waste management; wastewater treatment; air emissions control; air emissions monitoring and reporting. The model will be populated with data for various weapons systems. New CERs will be developed to relate the data streams to the environmental costs. Changes to the model will be made to make it more user friendly and to allow easy tracking of input data.

Classification: Unclassified

Sponsor: Naval Air Systems Command
21491 Great Mills Rd.
Lexington Park, MD 20653

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

Resources:

FY	*Dollars*	*Staff-years*
00	$130,000	

Schedule:

Start	*End*
Dec 99	Oct 00

Database: None

Publication: Validation Report, Software Users Manual

Keywords: Government, Environment, Review

NAVAIR–12

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
Cost Analysis Department
China Lake, CA 93556

Resources:

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

Schedule:

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

Database: None

Publication: Cost Analysis section of technical report.

Keywords: Government, Analysis, Weapon Systems, Production Rate, Cost Progress Curve

NAVAIR–13

Title: Missile Database

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

Classification: Unclassified

Sponsor: Naval Air Systems Command
21491 Great Mills Rd.
Lexington Park, MD 20653

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

Resources:

FY	*Dollars*	*Staff-years*
99	$87,000	.8
01	$75,000	.7
02	$75,000	.7

Schedule:

Start	*End*
Nov 99	Oct 02

Database:

Title:	Missile Database
Description:	Missile cost, technical, and programmatic data.
Automation:	Microsoft ACCESS application

Publication: Functional Requirements, System Specifications

Keywords: Estimating, Analysis, Database, CER, Missiles

NAVAIR–14

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

Performer: NAVAIR and Northrop Grumman/TASC

Resources	*FY*	*Dollars*	*Staff-years*
	00	$70,000	.5
	02	$150,000	1.0
	03	$150,000	1.0

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

Database: Cost Growth Database will support Cost Risk Model.

Publication: Test Case Models with Documentation

Keywords: Government, Estimating, Risk/Uncertainty, Method

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: 57 Support: 2 Consultants: 0 Subcontractors: 10
Focus:	O&S Cost Estimating; Total Ownership Cost Estimating; Commonality and Standardization of Ship Design and Construction Processes and of Ship Components or Sub-assemblies (impact on acquisition and O&S costs); Build Strategy Impact on Ship Costs; Ship Design Trade-Off Analysis Tools; Ship and Weapon System Cost Modeling
Activity:	Number of projects in process: 5 Average duration of a project: 2.2 years Average number of staff members assigned to a project: 1 Average number of staff-years expended per project: 1/2 Percentage of effort conducted by consultants: 0% Percentage of effort conducted by subcontractors: 90%

NAVSEA–1

Title: Material Vendor Survey

Summary: The objective of this annual survey is to capture future price trends and last year's actual price change for material used in Navy ship construction. The survey samples over 900 shipboard material and equipment suppliers, requesting their price changes for the current year and their projections of future price changes for the next two years. The results are grouped according to Ship Work Breakdown Structure (SWBS- Cost Groups 1-9), and indices are calculated.

Classification: Unclassified

Sponsor: Naval Sea Systems Command (SEA 0177)
1333 Isaac Hull Ave., SE
Washington Navy Yard, DC 20376-1340

Robert Venus, (202) 781-2796; DSN: 326-2796

Performer: Naval Shipyard Norfolk Detachment
NAVSEA Shipbuilding Support Office
3751 Island Avenue, 3rd Floor
Philadelphia, PA 19153

Joe Neumann

Resources:

FY	*Dollars*	*Staff-years*
Each year	$125,000	

Schedule:

Start	*End*
Oct each year	Sep each year

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:

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

Schedule:

Start	*End*
Oct 98	Oct 03

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

NAVSEA–3

Title: "System of Systems" Technology Refresh Cost Model

Summary: In FY99, NAVSEA Crane has leveraged off of existing cost estimating and model efforts relative to electronics technology refresh to develop a beta version of a model to generate a high level estimate of an aggregate of multiple military systems at the platform and battlegroup level. The goal of the modeling effort was to assist platform managers to establish budget thresholds for sustainment of systems' functionalities under today's ever-changing commercial marketplace by use of parametric estimating techniques to "model the existing model" used by NAVSEA Crane for technology refresh engineering changes. During FY01, the cost estimating relationships in the beta version are being updated based upon a greater of cost estimates for various system-level solutions. Additionally, the process of estimation using the model is being applied to the LPD-17 Amphibious Transport design to estimate the cost of technology refresh at the platform level.

Classification: Unclassified

Sponsor: PMS317

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

Resources:

FY	*Dollars*	*Staff-years*
2000	20K	
2001	150K	

Schedule:

Start	*End*
2000	2001

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

Publications: None to date

Keywords: Government, Estimating, Budgeting, Ships, Weapon Systems, Electronics/Avionics, SD&D, Production, Operations and Support, Engineering, Acquisition Strategy, Risk/Uncertainty, Sustainability, Modification, Mathematical Modeling, Database, CER

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: Support: Consultants: Subcontractors:	12 1 0 1
Focus:	The Cost Affordability Branch resides within the Theater Warfare Systems Department at the Naval Surface Warfare Center, Dahlgren Division (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: data collection and cost estimating relationship development for complex surface navy radar and missile systems during the development and production phases of a program.	
Activity:	Number of projects in process: Average duration of a project: Average number of staff members assigned to a project: Average number of staff-years expended per project: Percentage of effort conducted by consultants: Percentage of effort conducted by subcontractors:	2 2 years 2 100%

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:	Naval Surface Warfare Center (Code T51) Dahlgren Division Dahlgren, Virginia 22448-5100

Performer: Naval Surface Warfare Center (Code T51)
Dahlgren Division
Dahlgren, Virginia 22448-5100

Roxanne N. Harvey, (540) 653-8092
Amanda J. Cardiel, (540) 653-5235

Technomics, Inc.
5290 Overpass Road, Suite 206
Santa Barbara, CA 93111

John Horak, (805) 964-9894

Resources:

FY	*Dollars*	*Staff-years*
00-02	$250,000	

Schedule:

Start	*End*
Sep 00	Jul 02

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 3.1

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 will be implemented in an EXCEL spreadsheet model. This model is an update to the TBMD Missile Model completed in September 1997.

Classification: Unclassified (Proprietary)

Sponsor: Naval Surface Warfare Center (Code T51)
Dahlgren Division
Dahlgren, Virginia 22448-5100

Performer: Naval Surface Warfare Center (Code T51)
Dahlgren Division
Dahlgren, Virginia 22448-5100

Shelly A. Carney, (540) 653-1321
Amanda J.A. Cardiel, (540) 653-5235

Technomics, Inc.
5290 Overpass Road, Suite 206
Santa Barbara, CA 93111

John Horak, (805) 964-9894

Resources:

FY	*Dollars*	*Staff-years*
99-02	$180,000	

Schedule:

Start	*End*
Sep 99	Dec 01

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:	John C. Trumbule, (301) 227-4012, Email: trumblejc@nswccd.navy.mil	
Size:	Professional:	12
	Support:	2
	Consultants:	0
	Subcontractors:	6
Focus:		
Activity:	Number of projects in process:	22
	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:	30%

NSWCCD–1

Title: Product-Oriented Design and Construction (PODAC) Cost Model

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

Classification: Unclassified

Sponsor: Naval Sea System Command (SEA 05R2)
2531 Jefferson Davis Highway
Arlington, VA 22242-5160

Performer: Carderock Division, Naval Surface Warfare Center (Code 211)
9500 MacArthur Boulevard
West Bethesda, MD 20817-5700

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

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

Resources:

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

Schedule:

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

Data Base: Resident within cost model

Publications:
Production-Oriented Design and Construction (PODAC) Cost Model Plan of Action and Milestones and Functional Specification (FY 96)
Cost Estimating Relationships Development Plan (1997)
PODAC Cost Model Validation Plan (1997)
Product-Oriented Design and Construction Cost Model (1998)
Product-Oriented Design and Construction Cost Model – An Update (1999)

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

NSWCCD–2

Title: LEAPS Cost Support

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

Classification: Unclassified

Sponsor: Robert Ames, NSWCCD Code 26, (301) 227-3657, amesrm@nswccd.navy.mil

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

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

Resources:

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

Schedule:

Start	*End*	*Task*
April 00	Sep 00	Cost Model Inventory
April 00	Sep 00	Input variable list and definitions
April 00	Sep 00	Output information list and definitions
April 00	Sep 01	IPT participation
April 00	Sep 01	Focus object model development
April 00	Oct 01	Document Results

Data Base: Resident within cost model

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

Keywords: Government, Estimating, Ships, Mathematical Model

NSWCCD–3

Title: Force Level Ship Environmental Cost Model

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

Classification: Unclassified

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

POC: Ken Montgomery (301) 227-1007

Performer: Ken Montgomery (301) 227-1007

Resources:

FY	*Dollars*	*Staff-year*
01	$75,000	0.5

Schedule:

Start	*End*
FY01	FY01

Data Base: Environmental Compliance Database

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

Publications: None

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

Air Force Costs Analysis Agency (AFCAA)

Name:	Air Force Cost Analysis Agency
Address:	1111 Jefferson Davis Highway Suite 403 Arlington, VA 22202-4306
Director:	Mr. Joseph T. Kammerer, (703) 697-5312 Mr. Jay Jordan, Technical Director, (703) 604-0400 Ms. Deborah Cann, Research Chief, (703) 604-0402
Size:	Professional: 53 (authorized); 45 (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: 21 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 current capabilities of ACE-IT. Current enhancements are expected to include custom charting and tabular reports, integration with Word and redesigning report writer adding application interfaces and web enabling ACDB.

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: Tecolote Research, Inc.

Resources:

	FY	Dollars
Past Improvements	93-5	$646,000
Improvements	96-8	$410,000
Enhancements	99	$170,000
Enhancements	00	$220,000
Enhancements	02	TBD
Enhancements	03	TBD

Schedule:

	Start	End
Improvements	Jan 97	Sep 98
Enhancements	Oct 98	Jun 04

Database: N/A

Publications: ACE-IT user manuals and supporting documentation

Keywords: Industry, Government, Estimating, Analysis, 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 previously collected Air Force and Navy cost and technical data. The database will be flexible enough to allow for either an analogy-based or CER-based approach for both recurring and non-recurring costs of aircraft systems. The database will contain functional hourly and cost information as well as technical information for each hardware WBS element. Sources of data and normalization rationale will be completely documented. FY01 and FY02 efforts continuing to add F-18E/F data as well as repairing holes in the material costs of the F-15, F-14 and F-16 and ensuring the material costs associated with the AV-8B, F-14, F-15, F-16 and F-18 in the database were accurate and complete. Also, AV-8B purchased equipment data was added. FY03 efforts will focus on collecting and normalizing incoming data on newer programs, i.e., F-22, CV-22 and F/A-18E/F.

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:

	FY	*Dollars*
Phase I	93	$100,000
Phase II	96	$225,000
Phase III	97	$25,000
Phase IV	99	$80,000
Phase V	00	$120,000
Phase VI	01	$119,000
Phase VII	02	$100,000
Phase VIII	03	TBD

Schedule:

	Start	*End*
Phase I	Complete	
Phase II	Complete	
Phase III	Apr 98	Oct 98
Phase IV	Oct 98	Sep 99
Phase V	Oct 99	Sep 00
Phase VI	Oct 00	Sep 01
Phase VII	Oct 01	Sep 02
Phase VIII	Oct 02	Sep 03

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: This project develops and integrates specific Air Force requirements into the NASA Cost Model. The incorporation of Air Force requirements allows data and cost estimates to be displayed, analyzed, and used in a manner compatible with AF terminology and costing procedures. Phase II incorporated Air Force specific cost drivers into the Complexity Generator development process. Phase III incorporated phasing, risk analysis, and further generation of complexity factors. Phase IV delivered the next version of NAFCOM, adding additional features and utilities including developing sound methodologies for separating hardware and software costs. Phase V included continuation of the complexity generators for propulsion and control and data handling subsystem parameters. Phase VI contained a tool for searches of and export of the data for analysis. Phase VI also created complexity generators for thermal control, propulsion (minus engines), environmental control, crew accommodations, landing systems and solid rocket motors. Phase VI is also reviewing assumptions used for and statistical validity of CERs and providing 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:

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

Schedule:

	Start	*End*
Phase I	Complete	
Phase II	Complete	
Phase III	Complete	
Phase IV	Complete	
Phase V	Complete	
Phase VI	Apr 01	Jul 02

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: ACDB Missile Database Improvements

Summary: The objective of this project is to collect necessary data to perform periodic updates of the Automated Cost Data Base (ACDB) Missile Database. AFCAA and US Army CEAC fund this project on an alternating FY basis.

Classification: Unclassified

Sponsor: Air Force Cost Analysis Agency, Research and Resource Management Division

Army Cost and Economic Analysis Center (CEAC)
Mrs. Lynn Davis, (703) 604-0451; DSN: 664-0451
E-mail: Lynn.Davis@pentagon.af.mil

Performer: Tecolote Research, Inc.

Resources:

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

Schedule:

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

Database: *Title:* Missile Automated Cost Data Base (ACDB)

Description: Missiles and Munitions systems data

Automation: PC in FoxPro

Publications: User Manuals

Keywords: Government, Analysis, Programming, Forces, Mathematical Modeling, Computer Model, Life Cycle, Labor, Material, Data Collection, Database, Missiles

AFCAA–5

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

Summary: AFTOC's purpose is to capture as much Air Force cost data as possible without becoming a classified system and organizing the data to produce information about the cost to operate AF systems and infrastructure. Costs are reported for all appropriations for aircraft, space systems, munitions, and some C3I. Commodity level detail (by National Stock Number, MSD and GSD) is available for aircraft, by base and MDS, as well as for many subsystems. Munition expenditure costs as well as small missile expenditure and sustainment costs can be found in AFTOC. Indirect costs are reported by installation. For registered users, standard data products are available on the AFTOC web site and a user accessible multidimensional database can be reached through CITIRX or EXCEL 2000. The registration page can be found at 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, Litton-TASC, and OO-ALC/TISMD

Resources:

	FY	Dollars
Phase I	98	$2.0M
Phase II& III	99	$3.9M
Phase IV	00	$3.7M
Phase V	01	$3.6M
Phase VI	02	$3.3M
Phase VII	03	TBD

Schedule:

	Start	End
Phase I	Dec 97	Sep 98
Phase II	Oct 98	Mar 99
Phase III	Apr 99	Sep 99
Phase IV	Oct 99	Sep 00
Phase V	Oct 00	Sep 01
Phase VI	Oct 01	Sep 02
Phase VII	Oct 02	Sep 03

Database: SQL Server 2000

Publications: *TBD*

Keywords: Government, Reviewing/Monitoring, Aircraft, Space Systems, Missiles, Operations and Support, Data Collection, Database, Infrastructure, Logistics, Supply

AFCAA–6

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. The converter as well as the tutorial utilizes the use of Excel. The objective of this task is to support the use of the two applications described above to calculate and disseminate inflation information in a timely manner to the Air Force Secretariat, Air Staff, commands, and field operating agencies. Two areas of support include programming a custom generator report feature and updating the tool for new inflation indices. Increased funding for FY02 was in support of software reconfiguration to Microsoft Office 2000. The contractor shall revised the software programming of the Inflation Table Generator, the Inflation Indices Calculator and the Air Force Tutorial Program to rehost the programs in upgrades of Microsoft Windows and Excel programs used by the Air Force offices worldwide. The FY03 effort will again support the development of the annual inflation update as well as support further rehosting of programs to support future upgrades in Microsoft Windows and Excel.

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:

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

Schedule:

Start	*End*
Oct 96	Indefinite

Database: Excel

Publications: N/A

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

AFCAA–7

Title: Aircraft Avionics Systems Database and Study

Summary: The objective of this effort is to develop an avionics database that will be used to develop cost estimating relationships for estimating both federated and next-generation integrated avionics systems. However, the key element of the effort is to be able to make the bridge between federated and integrated avionics systems. There is an extensive data collection effort underway including programs such as F-22, Comanche, B-2, V-22 and JSF. This database is to include cost, technical and programmatic data for a wide range of systems across many different airborne platforms. Previously this task used both a traditional CER approach and a methodology to estimate avionics costs from the board level cost and performance descriptions. The FY01 effort further augmented data collection. FY02 effort is expanding and updating the current database. The contractor is developing a supportable methodology to estimate integrated avionics systems through the CERs it develops that shall support AFCAA requirements to estimate development, production and integration costs for such systems. FY03 will cross several phases in an effort to 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:

FY	*Dollars*
99	$212,000
00	$125,000
01	$100,000
02	$100,000
03	TBD

Schedule:

Start	*End*
Mar 99	Feb 00
Mar 00	Feb 01
Mar 01	Mar 02
May 02	May 03
May 03	May 04

Database: Excel

Publications: Final Report

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

AFCAA–8

Title: COTS Electronics Database/Modeling

Summary: The purpose of this project is to continue developing a cost database to quantify COTS hardware costs encompassing different ruggedization levels. Additional data will be collected and risk parameters will be added for increased analysis capability. In order to capture different ruggedization levels, parameters such as radiation hardness levels, vibration levels, temperature levels, and altitude levels will be analyzed to understand how these parameters impact costs. 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 as well as the estimating other COTS hardware items not currently supported by the existing hardware relationships. Data associated with AIS/C3I systems has been collected and includes hardware electronic components as well as various levels of non-hardware portions of the AIS/C3I programs. In FY01 the project became joint as the Navy Center for Cost Analysis (NCCA) also funded the continued developed of this effort. In FY02 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 FY02 Army funded box level performance based enhancement and NCCA funded COTS maintenance and updates of latest COTS prices. 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.

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:

FY	*Dollars*
99	$80,000
00	$17,000
01	$225,000
02	$255,000
03	TBD

Schedule:

Start	*End*
Sep 99	Indefinite
Mar 02	Aug 02
TBD	TBD

Database: Excel

Publications: Final Report

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

AFCAA–9

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 data embedded in these models requires regular updates to maintain currency. In addition, we often add new weapon systems to the suite of models. AFCAA also developed a SABLE model for conducting a variety of analyses on aircraft squadron operating and support costs. AFCAA Contingency computes the costs associated with aircraft deployments under a wide variety of user-defined scenarios. Both models are data intensive containing numerous internal cost factors. The Agency has also developed a Microsoft Access-based Cost Per Flying Hour tool.

The scope of this effort includes software development, software maintenance, cost analysis, data base administration and general technical support to the Agency for these tools. The three primary objectives of this effort are creating a single electronic data repository for storing the annual cost information published in Air Force Instruction (AFI) 65-503 and the data used as inputs to AFCAA cost models; creating the capability for automatic generation of reimbursement rates and updates to AFCAA cost models using the data stored in the repository; and maintaining and updating the Cost Per Flying Hour application. FY03 tool development will capture 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:

FY	*Dollars*
01	$150,900
02	$150,000
03	TBD

Schedule:

Start	*End*
Nov 00	Oct 01
Feb 02	Feb 03
TBD	TBD

Database: Access/Excel

Publications: Final Report

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

AFCAA–10

Title: Analysis of Cost Growth using Selected Acquisition Reports

Summary: The objective of this study is to analyze the contents of the DOD Selected Acquisition Reports (SARs) from their inception through the SARs submitted as part of the annual President's Budget SAR submission in December of each year. This analysis categorizes 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 research project improves our understanding of cost growth in order to enable better-informed decisions regarding both specific weapon system acquisitions and future resource and acquisition policy decisions. FY02 funding was provided by SAF/AQ for the updating of the database with annual SARs.

Classification: Unclassified

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

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

Schedule:

Start	*End*
Mar 01	Oct 01
Oct 02	Continuing

Database: None

Publications: In-work

Keywords: Government, Analysis, Weapon Systems, Study

AFCAA–11

Title: Missile and Munitions Sufficiency Review Handbook

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

Classification: Unclassified

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

Performer: Tecolote Research, Inc.

Resources:

FY	*Dollars*
02	$100,000

Schedule:

Start	*End*
Apr 01	Apr 02

Database: None

Publications: Final Report

Keywords: Government, Missiles, Aircraft, Review

AFCAA–12

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 an Aircraft and Aircraft Modifications Sufficiency Review Handbook and providing cost analysis assistance to the AFCAA. Phase II will focus on collection and 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:

FY	*Dollars*
01	$175,000
02	$175,000
03	TBD

Schedule:

Start	*End*
Apr 01	Dec 02
Jun 02	Jun 03
TBD	TBD

Database: Access/Excel

Publications: User Handbook

Keywords: Government, Estimating, Analysis, Modification, Risk/Uncertainty, SD&D, Aircraft Weapon System, Aircraft, Production, WBS, CER, Statistics/Regression, Data Collection

AFCAA–13

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. The FY02 effort primarily funds updating and expanding long-range planning models for the FY02 Air Force Capability Investment Strategy (AFCIS).

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
03	TBD

Schedule:

Start	*End*
Mar 02	Mar 03
TBD	TBD

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–14

Title: Measuring ROI for R&M Investments

Summary: The objective of the study 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. Determine and classify the purpose of the R&M modification into categories such as those defined above through interviews with appropriate OPRs and/or available literature/ documentation, budgets, available for the modifications. In addition, the project should address any projected cost increases or savings estimated with the R&M modifications and attempt to determine if the estimated costs or saving have materialized. The project

should address time frames associated with the R&M modifications and associated cost or saving.

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: TBD

Resources:

FY	*Dollars*
02	$125,000

Schedule:

Start	*End*
TBD	TBD

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–15

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

Summary: This project will 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. In addition, given the varied amount of data contained in AFTOC the research will determine if new factors can now be developed to help analysts and programmers produce more complete and comprehensive analyses.

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: TBD

Resources:

FY	*Dollars*
02	$100,000

Schedule:

Start	*End*
Jun 02	Jun 03

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–16

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:

FY	*Dollars*
02	$74,000

Schedule:

Start	*End*
May 02	May 03

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–17

Title: COTS Ground Antennas System

Summary: The objective of this effort is to collect performance specifications and pricing information for COTS ground antenna systems equipment and activities from open market sources and from direct equipment vendor quotes. This data will be used to enhance the COTS model by developing estimating relationships for COTS Ground Antennas Systems. The contractor shall investigate what are the necessary components of a workable COTS Ground Antenna System. The COTS ground antenna systems to be investigated must at a minimum be, but not be limited to, interoperable with Space based applications to include ground control systems and consider the appropriate infrastructure such as platforms and pedestals. The investigation of COTS antenna systems must consider applicable integration and test and installation activities. This information will be incorporated into the underlying COTS database and be used to establish validated and verified performance-based estimating relationship equations, including evaluation of forecasting error as currently provided in the model. The contractor will update programming and/or GUIs to accommodate new categories of COTS ground antenna system equipment and activities. Along with revising the database the documentation will be updated.

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: TBD

Resources:

FY	*Dollars*
02	$100,000

Schedule:

Start	*End*
TBD	TBD

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–18

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 the Space System Cost Model in FY03.

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*
02	$100,000

Schedule:

Start	*End*
Jun 02	Dec 02

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–19

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

Summary: The objective of the project will be 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 objective in this project will be to 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 focus of the project will be 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:

FY	*Dollars*
02	$125,000
03	TBD

Schedule:

Start	*End*
Jun 02	June 03
TBD	TBD

Database: Access/Excel

Publications: Final Report

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

AFCAA–20

Title: Aging Aircraft Study

Summary: The objective of the project will be to assess aging aircraft. This project will attempt to take collected parametrics for estimating cost per flying hour aging effects by airframe, avionics, and engines and expand on those parametrics to Mission/Design/Series (MDS) aircraft. It also updates previous information with additional data as well as more recent data.

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: TBD

Resources:

FY	*Dollars*
02	TBD

Schedule:

Start	*End*
TBD	TBD

Database: Access/Excel

Publications: Final Report

Keywords: Government, Estimating, Analysis, Risk/Uncertainty, Weapon Systems, Production, CER, Methodology, Statistics/ Regression, Data Collection, Manufacturing and Study

AFCAA–21

Title: Develop CPFH Contingency Calibration Factors

Summary: The objective of the project will be to develop CPFH factors that represent Contingency operations; also we need the capability to normalize historical data that reflects contingency operations to a peacetime scenario. This study funds the cost factors. It also funds the development of marginal cost factors that measure the incremental costs in weapon system changes.

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: TBD

Resources:	*FY*	*Dollars*
	03	TBD
Schedule:	*Start*	*End*
	TBD	TBD
Database:	Access/Excel	
Publications:	Final Report	
Keywords:	Government, Estimating, Analysis, Methodology, Statistics/Regression, Data Collection, Life Cycle, Database, Mathematical Modeling, Statistics/Regression, CER, and Computer Model	

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 Bldg. 14, Rm. 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: Support: Consultants: Subcontractors:	31 2.5 0 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: Average duration of a project: Average number of staff members assigned to a project: Average number of staff-years expended per project: Percentage of effort conducted by consultants:	2 12 months 3 2 70%

ASC/FMC–1

Title: Cost Communities of Practice (CoP) Portal

Summary: The Cost CoP Portal (https://afkm.wpafb.af.mil/ASPs/cost/entry.asp?Filter=Q) is a "yellow pages" for cost analysts supplemented by web-enabled collaboration tools. Major Portal capabilities include: cost related links, key word search, Provide Wisdom, Find Advice, "Tell a Friend", calendar of events, and various PT workspaces. Build I of the Portal became operational in May 2001. It was an 80% prototype solution with a heavy Aeronautical Systems Center flavor. In March 2002, SAF/FMC agreed to champion the Portal and manage its transformation into an Air Force wide cost tool.

Classification: Unclassified

Sponsor: ASC/FMCE
Mr. Michael Seibel, (937) 656-5458
Mr. Jeff Haney, (937) 656-5486
Ms. Sandy McCardle, (937) 255-7157

Performer: Northrop-Grumman Information Technology, Inc. (prime)

Triune Software, Inc. (sub)

Resources:

FY	*Dollars*	*Staff-Years*
FY00–FY01	$75K	.2
FY02	$72K	.2
FY03	TBD	

Schedule:

	Start	*End*
Build I	Sep 00	Jun 01
Build II (Spiral 1)	May 02	Jan 03

Database: No databases were created as part of this project.

Keywords: Industry, Government, Estimating, Analysis, Policy, Reviewing/Monitoring, Weapon Systems

ASC/FMC–2

***Title*:** Aeronautical Industry Wrap Rate Study

***Summary*:** The purpose of the Aeronautical Industry Wrap Rate Study is to provide cost analysts with the capability to build a set a generic labor wrap rates for use in estimating programs that are in the pre-contract award stage (i.e., no specific contractor has been chosen for the effort). The study consists of building wrap rates from FY00 billing rates for the following contractors and locations: Lockheed-Martin (Fort Worth, Palmdale, and Marietta), Boeing (Puget Sound, Southern California, and St Louis), Raytheon (McKinney), and Northrop-Grumman (Baltimore).

Classification: Unclassified

Sponsor: ASC/FMCE
Ms. Janet Wentworth, (937) 656-5484
Mr. Michael Seibel, (937) 656-5458

Performer: MCR Federal, Inc.

Resources:

FY	*Dollars*	*Staff-Years*
FY01	$50K	.1

Schedule:

Start	*End*
Aug 01	Aug 02

Database: Aeronautical Industry Labor Wrap Rates derived from FY00 billing rates

Keywords: Industry, Estimating, Analysis, Aircraft, SD&D, Production, Labor, Overhead/Indirect, Engineering, Manufacturing, Data Collection, Database

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

Name:	Pricing and Forecasting Group/Cost Forecasting (PFG/CF)—part of the Defence Procurement Agency	
Address:	Larch 1b #2109 MoD Abbey Wood Bristol BS3 4 8JH UK	
Director:	Head of PFG—Mr A. N. Pearse Head of CF—Mr. T. Proffitt	
Size:	Professional: 56 Support: 4 Consultants: 0 Subcontractors: 8 companies (>200 staff)	
Focus:		
Activity:	Number of projects annually: Average duration of a project: Average number of staff members assigned to a project: Average number of staff-years expended per project: Percentage of effort conducted by consultants: Percentage of effort conducted by subcontractors:	68 9-months 3 0.6 0 <30%

PFG/CF–1

Title: Software Support Cost Model Project (SSCMP)

Summary: The overall aim of the SSCMP was to develop a software package to enable procurers, managers and designers to estimate the costs of software support over the in-service life. The main study is complete and an independent review has confirmed the validity of the results. A Web enabled tool has been developed to implement the algorithms developed and training has been delivered to UK MoD users. Guidance has been issued. An update contract has been placed to ensure the model is current.

Classification: Unclassified

Sponsor: PFG UK MoD
Dr. David Thombs, 011-44-117913 34055

Performer: PFG and BMT Reliability consultants – Fareham, UK

Resources:

FY	*Dollars*	*Staff-years*
99/01	$250,000	1.0
01/02	$40,000	0.5
02/03	$40,000	0.5

Schedule:

Start	*End*
Dec 95	Oct 02

Database: MS Excel & Access for data storage, Minitab for analysis. Tool implemented in Java.

Publications: Various reports, presentations, user guides.

Keywords: Government, Estimating, Operations and Support, Software, Computer Model

PFG/CF–2

Title: Software of Unknown Pedigree (SOUP) in Safety Critical Systems

Summary: The aim of the project was to review the use of SOUP in Safety Critical Systems, develop an outline model to estimate whole life costs of the software elements and to develop outline guidance to enable procurers, managers and designers to minimise the risks of using SOUP. The study is complete and is progressing to the next phase, which is model validation. Guidance documents have been produced & presentations held.

Classification: Unclassified

Sponsor: PFG UK MoD
Dr. David Thombs, 011-44 - 117913 34055

Performer: PFG and Advantage, Farnham, UK

Resources:

FY	*Dollars*	*Staff-years*
00/01	$150,000	1.5
01/02	$40,000	0.5

Schedule:

Start	*End*
Apr 00	Jun 02

Database: MS Excel

Publications: Various reports, presentations, user guides

Keywords: Government, Estimating, Software

PFG/CF–3

Title: Family of Advanced Cost Estimating Tools (FACET) – Unmanned Air Vehicles & Ground Control Elements

Summary: These model are a sub set of the HVR-CSL FACET series. They cover fixed wing UAVs of all sizes, those used as targets, for artillery fire control, reconnaissance (tactical or strategic) in the suppression of enemy air defences and the Ground control station, Tactical Data Links, Launch & recovery elements, vehicles and associated manpower.

Features of the models are use of sizing rules and Baysian Techniques along side 'top down' parametric relationships.

Classification: Unclassified

Sponsor: PFG CFAir
Mr. Ron McKinlay 011-44 - 117913 34094

Performer: PFG and HVR CSL – Alton UK

Resources:

FY	*Dollars*	*Staff-years*
00/01	$30,000	0.05

Schedule:

Start	*End*
Apr 00	Jun 02

Database: None

Publications: User Guides

Keywords: Government, Estimating, Aircraft, C&TD, Computer Model

PFG/CF–4

Title: Operating and Support Cost Analysis Model for Land fighting equipment (OSCAM-Land)

Summary: This model was developed using a "system dynamics" approach. This approach provides a structured methodology for dealing with complex systems having many interacting components. A system dynamics approach enables capture of 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 estimating, as well as 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 fully analyzed in conjunction with their impact on equipment availability, and vice versa.

Classification: Unclassified when not containing equipment data.

Sponsor: PFG CFPOL
Mr. Phil Williams, PFG CFPol4, 011 44 117 9134030
DLO(WSA DTECH)

Performer: MOD in-house effort and HVR Consulting Services Ltd

Resources:

FY	*Dollars*	*Staff-years*
00/01	$50K	0.3
01/02	$30K	0.1 ongoing support

Schedule:

Start	*End*	
Jul 00	Sep 00	Version 4 development

Database: N/A

***Publications*:** Mathematical model and supporting documentation accessible via UK MOD Handbooks. Web site.

Keywords: Government, Estimating, Operations & Support, Mathematical Modelling, Computer Model

PFG/CF–5

Title: Automated Cost Resource Evaluation and Data Integration Tool (A-CREDIT)

Summary: The overall aim of A-CREDIT is to provide a repository of model outputs in a form that provides non-modeling specialists with the facility to carry out 'what if' calculations. It aligns with the UK MoD's move to resource accounting and budgeting. There is a facility to link outputs to budget holders and resource types. A mapping facility allows various commercial and bespoke cost models to be imported and set against a standard cost breakdown structure.

Classification: Unclassified when not containing equipment data.

Sponsor: PFG CFPOL
Mr. Julian Burridge PFG CFPol, 011 44 117 9134028

Performer: PFG and Advantage, Farnham, UK

Resources:

FY	*Dollars*	*Staff-years*
01	$70K	0.5
02	$70K	0.25

Schedule:

Start	*End*	
Jan 01	Jan 02	Version 2 complete
Jan 02	Jan 03	Version 3 planned

Database: MSACCESS & Excel

Publications: Handbooks, user guides, course work

Keywords: Government, Budgeting, Weapon Systems, Life Cycle, WBS, Mathematical Modeling, Database

PFG/CF–6

Title: Knowledge Assisted Cost Estimating Tool (KASCET) project

Summary: The aim of the project was to produce a knowledge based assistant which integrates derived models, existing models and the encapsulated expertise in a knowledge base PC tool. This will enable MoD staff to establish and reason about new project cost estimates. Initial work combined outputs for use in PRICE S and CoCommo. Latest work package will interface with SEER SEM.

Sponsor: Pricing and Forecasting Group UK MoD
Dr. D. A. Thombs, +44 117 31 34055.

Performer: RMCS Shrivenham

Resources:

FY	*Dollars*	*Staff-years*
01/02	£30k	0.3

Schedule:

Start	*End*
Jan 01	Dec 02

Database:

Publications:

Keywords: Government, Estimating, Weapons Systems; Expert System

PFG/CF–7

Title: Compensated Gross Tonnage (CGT) Factors in Naval Vessel Procurement

Summary: CGT is a normalized measure that allows the work content in different vessels to be compared on a common base. It has been used in commercial shipbuilding since the 1970s. This study addresses the measures for Royal Naval vessels and looks at comparative productivity of shipyards in the world.

Classification: Restricted—Commercial

Sponsor: Pricing and Forecasting Group UK MoD
Mr. Brian Tanner, +44 117 31 34074.

Performer: First Marine International

Resources:

FY	*Dollars*	*Staff-years*
01/02	$160k	0.3

Schedule:

Start	*End*
Jan 01	Dec 02

Database: N/A

Publications: Reports

Keywords: Government, Budgeting, Ships, Production, Manufacturing, Data Collection, Study

PFG/CF–8

Title: Naval WLC Model

Summary: The Naval WLC model is designed to allow all the costs associated with any Naval Platform to be assembled, analyzed and presented. Data is entered against a standard Cost Breakdown Structure and Equipment Breakdown Structure. It aligns to the UK CADMID phases and upkeep cycles.

Classification: Restricted

Sponsor: Pricing and Forecasting Group UK MoD
Mr. Brian Tanner, +44 117 31 34074

Performer: PFG and HVR Consulting Services Ltd

Resources:

FY	*Dollars*	*Staff-years*
01/02	$30k	0.3

Schedule:

Start	*End*
Jan 01	Dec 01

Database MS Access & Excel

Publications: Handbooks

Keywords: Government, Estimating, Ships, Life Cycle, WBS, Economic Analysis, Computer Model

PFG/CF–9

Title:	Operating and Support Cost Analysis Model for Ship and ship systems (OSCAM-Ship & Ship Systems) - Data Sets
Summary:	The models were developed with NCCA. This package of work relates to data sets for carriers, frigates, destroyers and nuclear submarines. Current activity on DMT and RFA data
Classification:	Restricted
Sponsor:	Model - Joint development with US NCCA Data sets – by PFG for UK vessels PFG CFSea Mr. Brian Tanner PFG CFSea, 011 44 117 9134074
Performer:	Advantage and HVR Consulting Services Ltd

Resources:

FY	*Dollars*	*Staff-years*
01/02	$30k	0.3

Schedule:

Start	*End*
Jan 01	Dec 01

Database:	MS Access & Excel
Publications:	Handbooks
Keywords:	Government, Estimating, Ships, Life Cycle, WBS, Economic Analysis, Computer Model

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

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

AFIT/ENV–1

Title: In Search of Block Build Savings Within Satellite Programs

Summary: The purpose of this research is to: 1) determine whether block build savings exist within satellite systems, 2) to quantify block build savings (separate from learning curve savings) found within current satellite systems, 3) to identify block build savings drivers, and 4) to develop a tool to estimate block build savings in future satellite system acquisitions. Some of the systems considered for research include, but are not limited to, AEHF, DSCS, GPS, and DSP.

Classification: Unclassified

Sponsor: SMC/MC

Performer: AFIT/ENV (2Lt Donald Adkins)

Resources: N/A

Schedule:

Start	*End*
Mar 2002	Mar 2003

Database: N/A

Publications: Pending

Keywords: Government, Analysis, Space Systems, Production, Manufacturing, Data Collection, Mathematical Model

AFIT/ENV–2

Title: Estimation Model for Cost Risk During the Engineering Phase of Acquisition Development

Summary: The purpose of this research will be to expand on earlier thesis work completed in the area of engineering cost risk, with the ultimate goal of providing a comprehensive model

to predict cost growth. This research will be accomplished primarily through the analysis of an up-to-date System Acquisition Report (SAR) database. Logistic regression will be used to analyze several categories of cost growth previously identified as possible predictors. Finally, multiple regression techniques will be used to model these previously identified categories.

Classification: Unclassified

Sponsor: ASC/FMCE

Performer: AFIT/ENV (Capt John Bielecki)

Resources: N/A

Schedule:

Start	*End*
Mar 2002	Mar 2003

Database: N/A

Publications: Pending

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

AFIT/ENV–3

Title: An Analysis of the Implementation of Acquisition Reform Cost Initiatives and Program Cost Variance

Summary: The purpose of this research is to determine if a mapping between cost initiatives and cost growth improvement exists. Based on this relationship, the focus will be on developing a model or "rule of thumb" to estimate the impact window or time frame in which to expect results for future cost related Acquisition Reform policies. DoD program data (Army, Navy, and Air Force) will primarily focus on DAES data regarding contract performance. The analysis will look at programs that begin before and after the various cost initiative implementations to assess any cost impact of the initiatives. During this research, the following questions will be addressed: 1) is there a relationship/mapping between Acquisition Reform cost initiatives implementation and improved cost variance in DoD acquisition programs, and 2) can this relationship be modeled, and if so, what does this model look like?

Classification: Unclassified

Sponsor: OSD/AT&L

Performer: AFIT/ENV (Capt Mark Holbrook)

Resources: N/A

Schedule:

Start	*End*
Mar 2002	Mar 2003

Database: N/A

Publications: Pending

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

AFIT/ENV–4

Title: Developing Cost Per Flying Hour Factors for Space Systems

Summary: The purpose of this research is to identify the primary cost drivers for satellites and apply the appropriate costs to each in order to arrive at an accurate, modifiable cost factor. The research will then aid in the ability to analyze and implement the correct cost factor to a variety of satellites. The cost per flying hour factor will be determined for an old system,

Defense Support Program (DSP), and a newer one, MILSTAR. This research will be initiated by a background review of the cost per flying hour program for aircraft. Through data obtained from previous theses at AFIT, databases at HQ AFSPC, and other data collection sources, the primary cost drivers for aircraft will be analyzed to determine a common basis with which to transition to satellites, where a cost factor will then be calculated. Once the data has been gathered and cost drivers have been established, through trials and modeling, a cost factor will be applied, tested, and evaluated for accuracy. Components impacting the factor include, but are not limited to, radar maintenance, software maintenance, upgrades, and contractor logistic support. This research will address the following questions: 1) what components drive the costs for each satellite configuration, 2) is one cost factor only applicable to one specific satellite configuration, 3) what affect will this cost factor have on budgeting/budget estimates, and 4) how frequently must the factor be adjusted in order maintain validity?

Classification: Unclassified

Sponsor: HQ AFSPC/FM

Performer: AFIT/ENV (1Lt Anthony Kimbrough)

Resources: N/A

Schedule:

Start	*End*
Mar 2002	Mar 2003

Database: N/A

Publications: Pending

Keywords: Government, Budgeting, Space Systems, Operations and Support, Sustainability, Data Collection, Mathematical Model

AFIT/ENV–5

Title: Integrating Cost as an Independent Variable (CAIV) Analysis with Evolutionary Acquisition for Command and Control (C2) Systems

Summary: The CAF C2 requirements and program management communities need a tool to facilitate system cost and performance tradeoffs. The purpose of this research is to develop a model that integrates CAIV requirements with the spiral development process. In doing so, this study will create a means to allocate current resources efficiently and effectively, respond rapidly to funding fluctuations, and plan for future development activities. This research will be accomplished by first identifying "cross-cutting" performance parameters for systems within the CAF C2 program portfolio. Having identified the appropriate parameters, relevant historical cost data will be collected. Once a sufficient database has been established, individual models will be created for the parameters (with cost being the independent variable in each case). Upon completion of this step, a unifying CAIV model will be established that optimizes overall system performance as a function of target cost. Early on, ESC/AC will identify a program from its portfolio requiring CAIV analysis. The model will be executed using this specific program's funding data for upcoming development spirals and increments. Model outputs will indicate whether adequate funding is available to meet current performance specifications or if performance trade-offs need to be accomplished.

Classification: Unclassified

Sponsor: ESC/AC

Performer: AFIT/ENV (1Lt Marc Lewis)

Resources: N/A

Schedule:

Start	*End*
Mar 2002	Mar 2003

Database: N/A

Publications: Pending

Keywords: Government, Analysis, Weapon Systems, Life Cycle, Acquisition Strategy, Data Collection, Method

AFIT/ENV–6

Title: Assessing Procurement Cost Growth Via Historical Cost Variance Data

Summary: The focus of this research is to develop a reliable and useful tool for the DoD cost analyst. Research will initially focus on reviewing past literature in the area of cost growth and cost risk. The next step will be to develop an updated System Acquisition Report (SAR) database. This database will then be used to define life cycle program cost variance profiles for each weapon system represented in the SAR database. Finally, using regression techniques, a model capable of predicting cost growth will be developed based upon these influential data points

Classification: Unclassified

Sponsor: ASC/FMCE

Performer: AFIT/ENV (1Lt Gary Moore)

Resources: N/A

Schedule:

Start	*End*
Mar 2002	Mar 2003

Database: N/A

Publications: Pending

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

AFIT/ENV–7

Title: An Analysis of the Federal Acquisition Streamlining Act and the Federal Acquisition Reform Act and Their Effect on Cost Overruns in ACAT I Acquisition Programs

Summary: The purpose of this research is to analyze the reform initiatives that were implemented in the mid-1990s and examine their effect on cost overruns in ACAT I acquisition programs. The research will be accomplished by obtaining contractual performance data from the DAES database. The contracts examined will be those that were completed from 1 Jan 94 through 31 Dec 01. The pivotal date for this research is 31 Dec 97. Contracts completed before the pivotal date will be compared to contracts completed after this date. If cost overruns were less after the pivotal date than they were before, the conclusion can be drawn that the FASA and FARA were successful from a cost perspective. This research will also look at the acquisition program by phase and use the same methodology employed for the entire contract to determine if there are cost performance differences when evaluated in each acquisition phase.

Classification: Unclassified

Sponsor: OSD/AT&L

Performer: AFIT/ENV (1Lt Andrew Mosier)

Resources: N/A

Schedule:

Start	*End*
Mar 2002	Mar 2003

Database: N/A

Publications: Pending

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

AFIT/ENV–8

Title: Evaluation of Software Cost Risk: A Look Beyond the Size Parameter

Summary: The purpose of this research is to determine what effect each parameter, other than software size, has on cost estimates produced using the parametric software models SLIM, Price-S, COCOMO II, and SEER-SEM. Employing a Design of Experiments (DOE) methodology, effects of varying some of the non-size factors of the software cost models will be documented. The results of each model will be compared to historical data to determine model accuracy. Finally, the results of each model will be compared to the remaining model's results in order to calibrate parameters.

Classification: Unclassified

Sponsor: AFCAA

Performer: AFIT/ENV (Capt Steven Quick)

Resources: N/A

Schedule:

Start	*End*
Mar 2002	Mar 2003

Database: N/A

Publications: Pending

Keywords: Government, Analysis, Weapon Systems, Life Cycle, Software, Data Collection, CER

AFIT/ENV–9

Title: A Comparative Analysis of the Cost Estimating Error Risk Associated with Flyaway Costs Verses Individual Components of Weapon Systems

Summary: The purpose of this research is to investigate the risks associated with taking a macro versus micro approach to cost estimation. By looking at the fidelity of a cost estimate performed at the flyaway cost level verses a cost estimate performed at the individual components level, this research will provide guidelines for appropriate allocation of cost estimating resources when time to conduct a detailed estimate is constrained. This research will be accomplished by first obtaining historical data on aircraft component and flyaway costs. Cost estimating relationships for the individual aircraft components will then be developed. The standard error for these components and the flyaway costs will then be calculated and compared. A statistical analysis will be accomplished to understand where the risk associated with aircraft cost estimation lies. During this research, the following questions will be addressed: 1) in which components do we have the most cost estimation error risk, 2) how does this risk compare to the overall risk in estimating flyaway costs, 3) is there a statistically significant difference in estimating at the component level verses the top level, and 4) given a short time frame, where should a cost estimator's emphasis on cost estimation lie?

Classification: Unclassified

Sponsor: ASC/FMCE

Performer: AFIT/ENV (Capt Jonathan Ritschel)

Resources: N/A

Schedule:

Start	*End*
Mar 2002	Mar 2003

Database: N/A

Publications: Pending

Keywords: Government, Analysis, Aircraft, Life Cycle, Engineering, Data Collection, Mathematical Model

AFIT/ENV–10

Title: Establishing a Framework for the Measurement of Weapon Systems Value

Summary: The purpose of this research is to develop a framework to objectively measure and assign a quantitative value to proposed weapon systems acquisitions. In the environment of constrained budgetary resources, the DoD needs to choose and develop the programs that will best suit the future needs of the force. The determination of value can be applied to the decision making process that leads to budget formulation and funding. This research will be accomplished through study of the commercial sector in regards to value. Numerous commercial organizations use methodologies to determine quantitative value of proposed projects. The study of the commercial sector will be the basis for proposing a construct capable of functioning within the non-profit environment of the DoD. During this research, the following questions will be addressed: 1) what value determination practices of the commercial sector can be applied to the DoD and how do they need to be altered, 2) how do you assign value to weapon systems, 3) where does this value methodology fit in the PPBS cycle, and 4) how do you implement the methodology in DoD?

Classification: Unclassified

Sponsor: SAF/AQ

Performer: AFIT/ENV (Capt Ian Walker)

Resources: N/A

Schedule:

Start	*End*
Mar 2002	Mar 2003

Database: N/A

Publications: Pending

Keywords: Government, Programming, Weapon Systems, Life Cycle, Acquisition Strategy, Survey, Study

The Aerospace Corporation (AERO)

Name:	Cost and Requirements Department, The Aerospace Corporation	
Address:	2350 E. El Segundo Blvd., El Segundo, CA 90245	
	Mail: M4-021, P.O. Box 92957, Los Angeles, CA 90009-2957	
Director:	Mr. Carl Billingsley, (301)336-0156, e-mail: carl.d.billingsley@aero.org	
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. domain specialist engineers)	20%
	Percentage of effort conducted by subcontractors:	0%

AERO–1

Title: Space Systems Costing Suite

Summary: Update of the existing Aerospace Corporation Satellite Cost Model. Future funding will be used for updating Aerospace Corporation's Launch Vehicle and Ground Systems Cost Models. Developments planned for the Space Systems Costing Suite includes new Infrared Sensor Payload and new Integrated Ground Stations Design and Costing Models.

Classification: Unclassified

Sponsor: The Aerospace Corporation's Internal Research and Development (IR&D) Program

Performer: The Aerospace Corporation
P.O. Box 92957, MS: M4-021
Los Angeles, CA 90009-2957

Ron Hovden, (310) 336-5832, ronald.e.hovden@aero.org

Resources:

FY	*Dollars*	*Staff-years*
02	$125,000	0.5

Schedule:

Start	*End*
FY 01	Ongoing

Database: None

Description: None

Publications: None as yet

Keywords: Industry, Government, Estimating, Space systems, Life Cycle, Acquisition Strategy, Data Collection, Mathematical Modeling, Statistics/Regression, CER, Computer Model

AERO–2

Title: Costs of Space, Launch, and Ground Systems

Summary: Historical costs of space, launch, and ground systems, including non-recurring and recurring costs of military and civil satellites and launch vehicles, payloads, launch processing, launch delays, launch failures, software, ground facilities, learning rates, and cost overruns.

Classification: Contractor-Proprietary; Government/FFRDC Eyes Only

Sponsor: The Aerospace Corporation's Internal Research and Development (IR&D) Program

Performer: The Aerospace Corporation
P.O. Box 92957, MS: M4-021
Los Angeles, CA 90009-2957
Larry Sidor, (310) 336-1571

Resources:

FY	*Dollars*	*Staff-years*
02	$50,000	0.2

Schedule:

Start	*End*
FY 87	Ongoing

Database: *Title:* Costs of Space, Launch, and Ground Systems

Description: Contractor-Proprietary Historical Costs ("Actuals" only)

Automation: Microsoft Excel spreadsheets

Publications: "Costs of Space, Launch, and Ground Systems," The Aerospace Corporation, 270 Briefing charts and facing page text, September 2000

Keywords: Industry, Government, Estimating, Space Systems, Life Cycle, Acquisition Strategy, Data Collection, Mathematical Modeling, Statistics/Regression, CER, Computer Model

AERO–3

Title: Terrestrial Component Architecture and Cost Module (TCACM)

Summary: This is a module added to Aerospace's Satellite Cost Model (SCM) designed to facilitate the assembly of the terrestrial components supporting the satellite into an overall system architecture. These elements can be COTS-based or developmental, and the costs are entered accordingly. The costs of the terrestrial elements are rolled up with the SCM-provided satellite costs to estimate the cost of the overall architecture.

Classification: Unclassified

Sponsor: Several Aerospace Corporation Program Offices

Performer: The Aerospace Corporation
P.O. Box 92957, MS: M4-021
Los Angeles, CA 90009-2957

N. L. Strang, (310) 336-6797; L. B. Sidor, (310) 336-1571, laurent.b.sidor@aero.org

Resources:

FY	*Dollars*	*Staff-years*
02	$50,000	0.2

Schedule:

Start	*End*
FY 02	Ongoing

Database: GSDOD Database

Description: *Title* Cost database

Automation: None

Publications: None as yet

Keywords: Industry, Acquisition Strategy, Estimating, Space Systems, C&TD, Case Study, Computer Model

AERO–4

Title: The Aerospace Corporation Small Satellite Cost Model (SSCM)

Summary: Parametric (CER-based) cost model, including cost-risk analysis capability, for estimating the cost of developing and producing a small- or micro-satellite bus.

Classification: Different forms of the model are releasable to government organization (e.g., DoD, NASA, NOAA) and to contributors of proprietary cost data on small- and micro-satellites.

Sponsor: Several Aerospace Corporation Program Offices

Performer: The Aerospace Corporation,
P.O. Box 92957, MS: M4-021
Los Angeles, CA 90009-2957

Jim Summers, (310) 336-6802, perry.j.summers@aero.org

Resources:

FY	*Dollars*	*Staff-years*
02	$70,000	0.4

Schedule:

Start	*End*
FY 87	Ongoing

Database:

Title: The Aerospace Corporation Small Satellite Cost Model (SSCM)

Description: Proprietary cost and technical data on current generation of small- and micro-satellite, low weight, single purpose, short lifetime, tactical, research or experimental satellites, including military, civil, commercial, university and foreign.

Automation: Microsoft Excel spreadsheets

Publications: P. J. Summers, N. Y. Lao, J. J. Muhle, "The Aerospace Corporation Small Satellite Cost Model," Aerospace Corporation Technical Report, May 2001

Keywords: Industry, Government, Estimating, Space Systems, Life Cycle, Acquisition Strategy, Data Collection, Mathematical Modeling, Statistics/Regression, CER, Computer Model, Risk/Uncertainty, C&TD, SD&D

The MITRE Corporation (MITRE)

Name:	The MITRE Corporation The Economic and Decision Analysis Center (EDAC)	
Address:	1820 Dolley Madison Boulevard McLean, VA 22102	
Director:	Mr. Howard Carpenter, (703) 883-5469	
Size:	Professional: Support: Consultants: Subcontractors:	100 6 0 0
Focus:	Cost and applied economic analysis, operations research, decision analysis, acquisition analysis, program management, risk management and analysis, life cycle management, logistics engineering, business process reengineering, business and technology case analysis, and information services and technology benchmarking.	
Activity:	Number of projects annually: Average duration of a project: Average number of staff members assigned to a project: Average number of staff-years expended per project: Percentage of effort conducted by consultants: Percentage of effort conducted by subcontractors:	~180 ~3-months 2 0.5 0% 0%

MITRE–1

Title: The Value of Return on Investment (ROI) Analysis to Non-Profit Organizations

Summary: MITRE is currently conducting research to determine how the government and other non-profit organizations can maximize benefit from ROI analysis. Through this research, MITRE will develop a guideline to help government agencies determine if and how ROI should be analyzed for particular investment options. This guideline will include a robust, scalable definition of ROI analysis that can more effectively be applied by government sponsors than existing methods and will promote a recommended standard approach for calculating ROI.

Classification: Unclassified

Sponsor MITRE IR&D

Performer: MITRE

Resources:

FY	*Dollars*	*Staff-years*
02	$330,000	1.5

Schedule:

Start	*End*
Oct 01	Sep 02

Database: None

Publications: Final report will be written

Keywords: Industry, Estimating, Analysis, Infrastructure, C&TD, Data Collection, Survey, Case Study, Method

MITRE–2

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

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

Classification: Unclassified

Sponsor MITRE IR&D

Performer: MITRE

Resources:

FY	*Dollars*	*Staff-years*
01	$150,000	

Schedule:

Start	*End*
Oct 00	Sep 03

Database: None

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

Keywords: Industry, Infrastructure, C&TD, Data Collection, Survey, Case Study, Computer Model, Method

RAND Corporation (RAND)

Name:	RAND Corporation Note: RAND has a center of excellence for cost analysis, but cost analysts also work on other, non-cost research projects within the various DoD-oriented divisions (Project Air Force, Arroyo Center, and National Defense Research Institute).
Address:	Main Office: 1700 Main Street Santa Monica, CA 90407-2138 Cost Research Office is located in the Washington office at: 1200 South Hayes Street, Suite 7310 Arlington, VA 22202-5050
Director:	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: Turbine Engine Costs: A Primer and Cost Estimating Methodologies

Summary: The last significant RAND turbine engine cost studies date from the late 1970s and early 1980s. ("Life Cycle Analysis of Aircraft Turbine Engines," R-2103-AF, published in 1977, by J. R. Nelson and "Development and Production Cost Estimating Relationships for Aircraft Turbine Engines," N-1882-AF, published in 1982, by J. L. Birkler, et.al). The objectives of the study are: In Phase I, develop a methodology to estimate development and production costs of future turbine engines, and evaluate the effects of DoD acquisition reform and industry affordability initiatives on engine costs. In Phase II, develop operations and support cost drivers and cost estimating methodologies for O&S costs.

Classification: Unclassified

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

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

Performer: RAND

Resources:

FY	*Dollars*	*Staff-years*
Approximately 3.0 staff years		

Schedule:

Start	*End*
Mar 2000	Jun 2002

Database: None

Publications: In work

Keywords: Government, Estimating, Aircraft, Propulsion, SD&D, Production, Operations and Support, Method

RAND–2

Title: Advanced Airframe Structural Materials Operating and Support Costs

Summary: This project will assess the impact on the operating and support costs of military aircraft of advanced airframe structural materials versus conventional aluminum. The research will focus on all operating and support costs related to the material characteristics of aircraft components as a function of material composition for a variety of Air Force and Navy aircraft. The products from the research will be better methodologies for use by cost analysts in estimating organizational, intermediate, and depot maintenance labor and material costs. This will provide better estimates of maintenance costs for DoD Milestone reviews, as well as for developing operating and support budgets for the services.

Classification: Unclassified

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

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

Performer: RAND

Resources:

FY	*Dollars*	*Staff-years*
Approximately 1.5 staff years		

Schedule:

Start	*End*
Nov 2000	May 2002

Database: None

Publications: In work

Keywords: Government, Estimating, Aircraft, Operations and Support, Method, CER

RAND–3

Title: Estimating Methodologies for Aircraft and Missile Testing Costs

Summary: The objectives of this project will be to:

- Analyze the nature of current aircraft and missile test and evaluation costs and trends likely to effect them in the immediate future
- Identify key cost drivers in the testing processes,
- Collect, normalize and document representative test and evaluation data
- Develop a set of practical, documented cost estimating methodologies.

These methodologies should be useful in developing estimates in the early stages of a program, before detailed technical and programmatic information is available, as well as for cross-checks later in the weapon system development phase when these more of these details should be available.

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:

FY	*Dollars*	*Staff-years*
Approximately 1.5 staff years		

Schedule:

Start	*End*
Nov 2000	Jul 2002

Database: None

Publications: In work

Keywords: Government, Estimating, Aircraft, Missiles, Test and Evaluation, 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 modifications will be analyzed using the Investment Budget Documentation System (IDOCS) database maintained by SAF/AQ and other sources. In the third phase, base operating support (BOS) relationships will be estimated. Finally, in the last phase, an O&S Handbook will be developed.

Classification: Unclassified

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

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

Performer: RAND

Resources:

FY	*Dollars*	*Staff-years*
Approximately 1.5 staff years annually		

Schedule:

Start	*End*
Phase 1, Nov 2000	Apr 2002
Phase 2, Apr 2002	Oct 2002
Phase 3, Nov 2002	May 2003

Database: None

Publications: In work

Keywords: Government, Aircraft, Operations and Support, CER

RAND–5

Title: Aging Aircraft

Summary: The objective of this study is to understand and quantify the causes and potential effects of increasing USAF aircraft fleet ages with particular attention to flight safety, aircraft availability and operating costs, then to identify effective ways to manage those effects.

Classification: Unclassified

Sponsor: Air Force Director of Maintenance (AF/ILM)

Performer: RAND

Resources:

FY	*Dollars*	*Staff-years*
Approximately 5.0 staff/year		

Schedule:

Start	*End*
Mar 1999	Oct 2003

Database: None

Publications: In work

Keywords: Government, Estimating, Aircraft, Operations and Support, Study

RAND–6

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:

FY	*Dollars*	*Staff-years*
Approximately one-half staff year		

Schedule:

Start	*End*
Mar 2001	Continuing

Database: None

Publications: In work

Keywords: Government, Analysis, Weapon Systems, Study

RAND–7

Title: Analysis of Systems Engineering/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:

FY	*Dollars*	*Staff-years*
Approximately one-half staff year		

Schedule:

Start	*End*
May 2002	May 2003

Database: None

Publications: None

Keywords: Industry, Analysis, Manufacturing, Study

CNA Corporation (CNAC)

Name:	CNA Corporation, Cost and Acquisition Team	
Address:	4825 Mark Center Drive Alexandria, VA 22311-1850	
Director:	Dr. Matthew S. Goldberg, (703) 824-2455, E-mail GOLDBERM@cna.org	
Size:	Professional:	6
	Support:	2
	Consultants:	8
	Subcontractors:	1
Focus:	Cost estimation for DoD programs; analysis of DoD acquisition policy; investigation of defense industrial base	
Activity:	Number of projects in process:	5
	Average duration of a project:	10 months
	Average number of staff members assigned to a project:	3
	Average number of staff-years expended per project:	2.25
	Percentage of effort conducted by consultants:	25%
	Percentage of effort conducted by subcontractors:	5%

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:

FY	*Dollars*	*Staff-years*
02	$145,000	0.45

Schedule:

Start	*End*
Oct 01	Sep 02

Database: TBD

Publications: TBD

Keywords: Government, Reviewing/Monitoring, Weapon Systems, Training, Study

CNAC–2

Title: Acquisition Management Analysis

Summary: This project is creating corporate profiles of the largest DoN contractors. The information contained in each profile will include the corporate organization, income statement, balance sheet, debt structure, major product lines, teaming and subcontracting arrangements, and foreign military sales. Each profile will also document the recent history in terms of stock-market performance, debt issues and bond ratings, as well as other newsworthy event such as results of operational tests. The profiles will also list the DoN and other DoD programs on which the contractor is currently working, bidding, or expected to bid.

Classification: Unclassified

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

Performer: CNA Corporation, Cost and Acquisition Team

Dr. Matthew S. Goldberg, (703) 824-2455

Resources:

FY	*Dollars*	*Staff-years*
00	$225,000	1.0
01	$245,000	1.1
02	$65,000	0.3

Schedule:

Start	*End*
Apr 00	Sep 02

Database:

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

Publications: Initial reports and periodic updates on each of the 10 largest DoN contractors

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:

FY	*Dollars*	*Staff-years*
02	$225,000	1.0

Schedule:

Start	*End*
Feb 02	Nov 02

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: Improving Metrics for Acquisition Management — Phase II

Summary: An earlier CNA study surveyed the metrics that DoN currently uses to monitor acquisition programs, as well as metrics used by other military and executive-branch departments of the federal government and by private industry. The current study extends that effort by identifying areas of improvement in specific metrics, the process for establishing metrics, and the process for evaluating metrics. We will note areas where improvements might be made, with an emphasis on process and how to achieve the desired improvements. The focus will be on metrics and processes that foster achievement of outcome objectives rather than simply measuring activity.

Classification: Unclassified

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

Performer: CNA Corporation, Cost and Acquisition Team

Mr. Gary Christle, (703) 824-2693

Resources:

FY	*Dollars*	*Staff-years*
02	$70,000	0.35

Schedule:

Start	*End*
Oct 01	July 02

Database: TBD

Publications: TBD

Keywords: Government, Reviewing/Monitoring, Weapon Systems, SD&D, Production, Study

CNAC–5

Title: Army Acquisition Management

Summary: An earlier Congressionally-mandated CNA report made recommendations to improve the Army's requirements generations, major-system acquisition, and resource management processes. The objective of the current follow-on effort, also Congressionally mandated, is to determine whether and to what extent the Army has implemented the recommendations that CNA made in its earlier report.

Classification: Unclassified

Sponsor: Deputy Under Secretary of the Army

Performer: CNA Corporation, Cost and Acquisition Team

Mr. Anthony DiTrapani, (703) 824-2282

Resources:

FY	*Dollars*	*Staff-years*
01	$1,000,000	4.5
02	$185,000	0.6

Schedule:

Start	*End*
Mar 02	May 02

Database: None

Publications: TBD

Keywords: Government, Reviewing/Monitoring, Weapon Systems, Programming, Budgeting, 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: 50 Support: 5 Consultants: 40 Subcontractors: 2	
Focus:	Cost of Weapon Systems, Forces, and Operations	
Activity:	Number of projects in process: Average duration of a project: Average number of staff members assigned to a project: Average number of staff-years expended per project: Percentage of effort conducted by consultants: Percentage of effort conducted by subcontractors:	55 1 year 2-4 1 30% 2%

IDA–1

Title: Assessment of CCDR System

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

During the past six years, the CCDR Project Office (CCDR-PO) has led an ongoing joint DoD and industry effort to re-engineer CCDR policies and business rules to improve the quality, relevancy, and availability of actual cost data. Significant progress has been made with the release of the CCDR Manual, changes to the DoD 5000.2-R, Mandatory Procedures for MDAPs and MAIS Acquisition Programs, revisions to the reporting formats, and deletion of the Plant-Wide Data Report requirement. While much has been done, several important areas still need to be addressed such as exploring alternative reporting approaches, assessing process activities, developing performance metrics, assessing contractor cost accounting practices, and assessing the effect of new reporting requirements for software projects.

Classification: Unclassified

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

Performer: IDA
Mr. Jack Cloos, (703) 845-2506, jcloos@ida.org

Resources:

FY	*Dollars*	*Staff-years*
FY01	$150,000	
FY02	$150,000	

Schedule:

Start	*End*
Oct 96	Feb 03

Database: Not applicable

Publications: None

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

IDA–2

Title: O&M Program Balance & Related Cost Drivers

Summary: The principal purposes of operations and maintenance (O&M) funding are to maintain the readiness of the Services' combat forces and to provide the needed infrastructure to support those forces. DoD O&M funding exceeds $100 Billion, or more than a third of the defense budget. Despite its size, there are currently no fully adequate tools that can be used to assess the appropriateness of O&M funding levels. The current research objective is to continue the identification and validation of cost drivers and to develop basic cost estimating relationships. These relationships can be used to benchmark Military Service and Defense Agency O&M funding. These benchmarks help OSD in its task of evaluating Service/Agency programs and can aid the understanding of how they construct their O&M programs. (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
Daniel L. Cuda, (703) 578-2770, dcuda@ida.org

Resources:

FY	*Dollars*	*Staff-years*
00	$230,000	1.5
01	$200,000	1.2
02	$350,000	2.2

Schedule:

Start	*End*
Sept 99	Dec 02

Database: Historical O&M by Service Component and O&M SAG, 1981-2001

Publications: Background Briefings

Keywords: Government, Analysis, Policy, Programming, Data Collection, Database, Study, Operations and Support, Readiness

IDA–3

Title: Ballistic Missile Technical Collection Analysis of Alternatives

Summary: Provides cost analysis estimates in support of the Ballistic Missile Technical Collection Analysis of Alternatives (AOA). 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. An analyst on the staff of the OSD(CAIG) directed the Cost Panel. 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.

Classification: Unclassified with proprietary data

Sponsor: Office of the Director, Program Analysis and Evaluation (PA&E)

Performer: IDA with subcontractor support from Technomics
Mr. Waynard Devers, (703) 845-2252, wdevers@ida.org

Resources:

FY	*Dollars*	*Staff-years*
2001	$300,000	1.75

Schedule:

Start	*End*
Feb 2001	Dec 2001

Database: None

Publications: "Analysis of Alternatives (AOA) for Ballistic Technical Collection (BMTC): Review of Cost Estimates," IDA Paper P-3632, Draft Final, August 2001

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(A&T)/API/AR
The Pentagon, Rm. 3D765
Washington, DC 20301
Mr. Steve Dratter, (703) 697-8020

Performer: IDA
Mr. David A. Drake, (703) 845-2573, ddrake@ida.org

Resources:

FY	*Dollars*	*Staff-years*
99	$75,000	0.6
00	$50,000	0.4
01	$75,000	0.6

Schedule:

Start	*End*
Jan 99	Indefinite

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: Economic Drivers of Defense Overhead Costs

Summary: The objective of this task is to identify the economic and regulatory factors that drive the overhead costs charged by defense firms. A theoretical model of overhead costs from an economic framework will be developed. The model will be used to analyze the relationship of economic factors and DoD regulations on contractor overhead costs under current business practices. The model will also assess how changes in DoD regulations impact the balance of economic forces.

Classification: Unclassified/Company Proprietary

Sponsor: OD(PA&E)
The Pentagon, Rm. BE799
Washington, DC 20301
Mr. Gary Pennett, (703) 695-4348

Performer: IDA
Dr. Thomas Frazier, (703) 845-2132, tfrazier@ida.org

Resources:

FY	*Dollars*	*Staff-years*
95	$250,000	
96	$250,000	
00	$175,000	
02	$150,000	

Schedule:

Start	*End*
Apr 95	Sep 01

Database: *Title:* IDA's Defense Contractor Overhead Database, Contractor Cost Data Reports
Description:
Automation: Incorporating data into an automated database.

Publications: None

Keywords: Industry, Government, Estimating, Overhead/Indirect, Economic Analysis, Study

IDA–6

Title: Aircraft Production Capacity Analysis at the Plant Level

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

Classification: Secret/Proprietary Information

Sponsor: USD(AT&L)/IA/ICA
Washington, DC 20301
Ms. Christine Fisher, (703) 601-5008

Performer: IDA
Dr. Thomas P. Frazier, (703) 845-2132, tfrazier@ida.org

Resources:

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

Schedule:

Start	*End*
June 99	Sept. 02

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

Publications: Draft paper in work

Keywords: Government, Estimating, Analysis, Aircraft, Production, Data Collection, Database, Method

IDA–7

Title: Affordable Multi-Missile Manufacturing (AM3)

Summary: IDA will support DARPA/DoD evaluation of missile industry cost reduction initiatives to be submitted in the form of Integrated Portfolio Benefit Analyses. As part of this support, IDA will provide guidance to the industry teams related to analytical ground rules and methods. IDA will comment on the realism of the proposed savings and, where appropriate, recommend adjustments. Summarized findings will be presented as a report, and will be used in the award of Phase III Factory Demonstrations.

Classification: Unclassified

Sponsor: Defense Advanced Research Projects Agency
3701 North Fairfax Drive
Arlington, VA 22203-1714
Dr. Bill Scherun, (703) 696-2224

Performer: IDA
Dr. Thomas P. Frazier, (703) 845-2132, tfrazier@ida.org

Resources:

FY	*Dollars*	*Staff-years*
96	$200,000	1.25
97	$200,000	1.25
98	$325,000	2.25
00	$300,000	2.00

Schedule:

Start	*End*
Nov 95	Sep 01

Database: None

Publications: Final briefing

Keywords: Industry, Estimating, Analysis, Missiles, SD&D, Production, Operations and Support, Labor, Material, Overhead/Indirect, Engineering, Manufacturing, Acquisition Strategy, Automation, Integration, Data Collection, Mathematical Modeling, Statistics/Regression, Database, Review, CER, Study

IDA–8

Title: Defense Economic Planning and Projection Systems (DEPPS)

Summary: Maintain the currency of the Defense Translator within DEPPS by periodically updating the various sections of the translator associated with the appropriations accounts. The Defense Translator accounts for the distribution of defense spending among the industries producing the goods and services that DoD buys, and describes the commodity composition of defense demands.

Classification: Unclassified

Sponsor: OD(PA&E)/RA/EARPD
The Pentagon, Rm. BE798
Washington, DC 20301
Mr. Ron Lile, (703) 614-3840

Performer: IDA
Dr. Thomas Frazier, (703) 845-2132, tfrazier@ida.org

Resources:

FY	*Dollars*	*Staff-years*
85	$122,000	1.0
87	$182,000	1.5
88	$40,000	0.3
90	$75,000	0.6
92	$60,000	0.5
93	$80,000	0.7
94	$160,000	1.1

	97	$30,000	0.2
	98	$30,000	0.2
	99	$30,000	0.2
	00	$30,000	0.2
	01	$30,000	0.2

Schedule:

Start	*End*
Jul 85	Dec 01

Database: None

Publications: "A Comparison of the DEIMS and the Department of Commerce Translator Vectors," IDA Paper P-2647, T. P. Frazier, S. K. Welman, and R. H. White, March 1993

"A User's Manual for the Revised Defense Translator Model," IDA Document D-796, T. P. Frazier and J. B. Tate, June 1990

"The Revised Defense Translator," IDA Paper P-2141, T. P. Frazier, C. G. Campbell, and R. T. Cheslow, October 1989

Keywords: Industry, Government, Analysis, Budgeting, Mathematical Modeling, Economic Analysis, Study

IDA–9

Title: DSCA Business Metrics

Summary: The objective of this task is identify and quantify the business process steps being followed in each Service during FMS administration and to relate those efforts to the types of cases being managed. The ultimate goal is to provide the DSCA Comptroller with a way of quantifying the cost of administering each case and of performing additional functions that are not in support of specific cases (such as price and availability quotations). A preliminary objective is to learn more about Service operations by facilitating meetings with Service representatives where approaches to identifying and measuring business process metrics can be designed.

Classification: Unclassified

Sponsor: Defense Security Assistance Agency
DSAA Comptroller
Mr. Bill Johnson, (703) 604-6586

Performer: IDA
Dr. Thomas P. Frazier, (703) 845-2132, tfrazier@ida.org

Resources:

FY	*Dollars*	*Staff-years*
97	$300,00	2

Schedule:

Start	*End*
Jul 99	Oct 02

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 contingency operations, and to further develop the automated tool for conducting such estimates**.** These procedures and automated tool will be utilized by the OSD(C), Joint Staff, and the Military Departments to estimate the costs 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
Michael Frieders, (703) 845-2140, mfrieder@ida.org

Resources:

FY	*Dollars*	*Staff-years*
01	$425,000	
02	$600,000	

Schedule:

Start	*End*
Oct 01	July 03

Database: Microsoft Access

Publications: COST Users Guide
COST Executables

Keywords: Government, Estimating, Computer Model

IDA–11

Title: Army Enlistment Early Warning System

Summary: This task constructs an enlistment early warning system for the Services.

Classification: Unclassified

Sponsor: Greg Wise, OSD, PA&E, Economic Analysis and Research

Performer: IDA
Dr. Lawrence Goldberg, (703) 578-2831, Lgoldber@ida.org

Resources:

FY	*Dollars*	*Staff-years*
2001	400,000	2.0

Schedule:

Start	*End*
Aug 00	Jun 02

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
1725 Jefferson Davis Highway
Crystal Square 2, Suite 1200
Mr. Andy Manteki, (703) 604-3764

Performer: IDA
Mr. Bruce Harmon, (703) 845-2510, bharmon@ida.org

Resources:

FY	*Dollars*	*Staff-years*
99 and prior	$215,000	1.4

Schedule:

Start	*End*
Jan 91	Jun 02

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	$550,000	3.5
FY01	$200,00	1.5

Schedule:

Start	*End*
Jan 98	Sept 02

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: 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 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*
FY00	$200,000	1.5

Schedule:

Start	*End*
Jan 00	Sept 02

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, jhiller@ida.org

Resources:

FY	*Dollars*	*Staff-years*
02	$300,000	

Schedule:

Start	*End*
Feb 02	Feb 03

Database: None

Publications: Annotated briefing of final results

Keywords: Estimating, Electronics/Avionics, Life Cycle

IDA–16

Title: Assessment of BMDO Cost Estimation Methodology and Cost Control/Cost Reduction Initiatives

Summary: Assess effect of cost control/reduction initiatives funded by BMDO, assess key cost estimation methodologies, and assist BMDO in development of joint cost methodology.

Classification: Unclassified

Sponsor: Ballistic Missile Defense Organization

Performer: IDA
John Hiller, (703) 845-6783, jhiller@ida.org

Resources:

FY	*Dollars*	*Staff-years*
00	$255,000	2+

Schedule:

Start	*End*
May 00	Jul 01

Database: None

Publications: None

Keywords: Government, Estimating, Missiles, Electronics/Avionics, Life Cycle, Case Study, Review

IDA–17

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
Mr. Stanley A. Horowitz, (703) 845-2450, shorowit@ida.org

Resources:

FY	*Dollars*	*Staff-years*
97	$340,000	2.2
98	$360,000	2.3
99	$175,000	1.1
00	$158,000	1.0
01	$100,000	0.7
02	$ 90,000	0.6

Schedule:

Start	*End*
Oct 96	Dec 02

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–18

Title: Active/Reserve Integration

Summary: This work is designed to examine alternative ways to integrate active and reserve forces, particularly in the Army. For Army National Guard combat units, a key aspect of successful integration is being able to mobilize, train, and deploy for combat fast enough to effectively carry out its combat mission. The project has examined how long it would take Guard brigades and divisions to deploy. In addition it is looking at how best to provide command and staff training for National Guard combat units and the use of the Reserve Components to help shape the international environment.

Classification: Unclassified

Sponsor: Assistant Secretary of Defense (Reserve Affairs)
The Pentagon, Rm. 2E515
Washington, DC 20301
Ms. Karen McKinney, (703) 697-4223

Performer: IDA
Mr. Stanley A. Horowitz, (703) 845-2450, shorowit@ida.org

Resources:

FY	*Dollars*	*Staff-years*
96	$175,000	1.0
97	$250,000	1.4
98	$300,000	1.6
99	$300,000	1.6
00	$ 50,000	0.3

Schedule:

Start	*End*
Jan 96	Dec 01

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.

Keywords: Government, Analysis, Policy, Manpower/Personnel, Readiness, Data Collection, Database, Study

IDA–19

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

Mr. Stanley A. Horowitz, (703) 845-2450, shorowit@ida.org

Resources:

FY	*Dollars*	*Staff-years*
98	$600,000	3.2
99	$300,000	1.6
00	$300,000	1.6

Schedule:

Start	*End*
Feb 98	Dec 02

Database: TBD

Publications: TBD

Keywords: Government, Analysis, Policy, Infrastructure, Facilities, Overhead/Indirect, Data Collection, Cost/Production Function, Study

IDA–20

Title: Management Headquarters Analysis

Summary: This project is designed to help DoD respond to the requirements of the FY 2000 National Defense Authorization Act regarding the documentation and evaluation of management headquarters activity

Classification: Unclassified

Sponsor: Director, Program Analysis and Evaluation
The Pentagon, Rm. 3E836
Washington, DC 20301

Mr. Bart Rhoades, (703) 695-4281

Performer: IDA

Mr. Stanley A. Horowitz, (703) 845-2450, shorowit@ida.org

Resources:

FY	*Dollars*	*Staff-years*
00	$300,000	1.8

Schedule:

Start	*End*
Nov 99	Dec 01

Database: TBD

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–21

Title: Workload Forecasting for the Veterans Benefits Administration

Summary: The objective of this task is to forecast the number of veterans who will apply or reapply for VA disability compensation benefits over a five-year horizon. Veterans are eligible for these benefits if they are disabled due to injury suffered or disease contracted while serving in the military. The forecasts will be used to determine the administrative staff required to adjudicate and process VA compensation claims. The model and final report was delivered to the VBA in August 2000. In FY02, we agreed to use the remaining task funding to update the forecast using the FY00 and FY01 data.

Classification: Unclassified

Sponsor: Veterans Benefits Administration
Ms. Judy Reyes-Maggio, (202) 273-7203

Performer: IDA
Dr. David E. Hunter, (703) 845-2549, dhunter@ida.org

Resources:

FY	*Dollars*	*Staff-years*
98	$300,000	2.0
99	$150,000	1.0
00	$100,000	0.75
02	$50,000	0.25

Schedule:

Start	*End*
Sep 98	May 02

Database:

Title:	Compensation Workload Forecasting Model
Description:	Demographic data on the actual veteran population; projections of the veteran population for five future years; and factors for disability claim submission rates within demographic cells
Automation:	Visual Basic interface with Microsoft Access database

Publications: "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–22

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. The previous

evaluations have compared TRICARE costs in the year of interest with an estimate of what those costs would have been had the traditional benefit been continued. This year's evaluation will take a different approach by examining trends in TRICARE utilization and costs over the past few years and comparing them with corresponding civilian-sector benchmarks.

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
Dr. Philip M. Lurie, (703) 845-2118, plurie@ida.org

Resources:

FY	*Dollars*	*Staff-years*
00	$427,800	1.9
01	$783,000	3.6

Schedule:

Start	*End*
Oct 01	Sep 02

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–23

Title: Resource Analysis for Operational Test and Evaluation (OT&E)

Summary: Conduct resource analysis to aid DOT&E in determining the adequacy of OT&E resources in the Services' Program Objective Memorandum and the Future Years Defense Program. Conduct analyses to support DOT&E participation in senior level OSD activities associated with the Planning, Programming and Budgeting System, and for developing resource related policy recommendations throughout the PPBS cycle.

Classification: Top Secret

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
Mr. Dennis O. Madl, (703) 578-2718, dmadl@ida.org

Resources:

FY	*Dollars*	*Staff-years*
FY98	$200,000	1.2
FY99	$100,000	0.6
FY00	$400,000	2.5
FY01	$400,000	1.9
FY02	$400,000	2.4

Schedule:

Start	*End*
Feb 98	Ongoing

Database:

Title:	OT&E Resources
Description:	Programmed and Budgeted Funds, Manpower
Automation:	Excel spreadsheets

Publications: "DOT&E GPRA Methodology and Definitions, FY 2001: Government Performance and Results Act," IDA Document D-2570, FY 2001

"Marine Corps Operational Test and Evaluation Activity Manpower Assessment," IDA Document D-2578 (Nonstandard), February 2001

"Proposed Performance Metrics and methodology for Weapons System Testing for 2002 and Beyond Under the Government Performance and Results Act (GPRA)," IDA Document D-2708, forthcoming

Keywords: Government, Analysis, Policy, Programming, Budgeting

IDA–24

Title: Resource Analysis for Test and Evaluation—MRTFB

Summary: Analysis of resources devoted to the Major Range and Test Facility Base to include operating cost, investment cost, and personnel resources. Analyses include cost comparisons of alternative approaches to developing test and evaluation capability and realigning workload within existing infrastructure. Evaluation will include identification of efficiencies in management, operations, and resource processing. Also, conduct analysis to support reporting in the Director of Operational Test and Evaluation (DOT&E) Annual Report to Congress.

Classification: Top Secret

Sponsor: Deputy Director, Resources and Ranges (DOT&E/RR)
Director, Operational Test and Evaluation (DOT&E)
The Pentagon, Rm. 3D1067
Washington, DC 20301

Mr. John Gehrig, (703) 681-4024 ext 102

Performer: IDA
Mr. Dennis O. Madl, (703) 578-2718, dmadl@ida.org

Resources:

FY	*Dollars*	*Staff-years*
01	$2,500,000	13.8
02	$2,500,000	13.1

Schedule:

Start	*End*
Oct 00	Ongoing

Database: *Title:* T&E Resources

Description: Operating Cost, Investment Projects, Real Property

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

"The Partnership Between the Boeing Company and the Air Force's National Radar Cross Section Test Facility: A Review," IDA Document D-2577, February 2001

"Demographic Analysis of the Operational Test Agencies' Workforce," IDA Document D-2618, forthcoming

"Working Capital Fund for Test and Evaluation," IDA Document D-2629, Unclassified, April 2001

"Government Corporation: A Management Model for Test and Evaluation Infrastructure," IDA Document D-2684, forthcoming

"A Case Study on the Partnership Between Arnold Engineering Development Center and Loral," IDA Document D-2689, forthcoming

"Improvement in Test and Evaluation of Weapon Systems and Test Facility Resources," IDA Document D-2690 (Nonstandard), forthcoming

"White Paper on DoD Test and Evaluation Executive Agent," IDA Document D-2691 (Nonstandard), February 2002

Keywords: Government, Analysis, Policy, Programming, Budgeting, Infrastructure, SD&D, Test and Evaluation, Operations and Support, Acquisition Strategy, Labor, Overhead/Indirect, Economic Analysis, Study, Database

IDA–25

Title: Resource Analyses for Technology Protection

Summary: In response to the DoD acquisition reform initiative, the policies for Acquisition Protection Program were revised to provide new methods and procedures. OSD and the DoD Components are expanding program protection to focus on protecting technologies early in the research and development cycle at the DoD laboratories and test and evaluation (T&E) centers. IDA will analyze existing methods, approaches, and resources and provide the sponsor with proposals for formulating a DoD approach to protecting technologies throughout the life cycle from applied research through acquisition and operation. IDA will also provide policy and process analyses in support of an ASD(C3I) community (security, intelligence, and counterintelligence) desk book.

Classification: Secret

Sponsor: Director of Security
Office of the DASD (Security & Information Operations)
OASD(C3I)
1931 Jeff Davis Highway, Suite 600
Arlington, VA 22202
Mr. Richard Williams, (703) 614-0578

Performer: IDA
Mr. Thomas A. Musson, (703) 578-2729, tmusson@ida.org

Resources:

FY	*Dollars*	*Staff-years*
FY92	$500,000	3.4
FY94	$160,000	1.0
FY95	$75,000	0.5
FY98	$75,000	0.5
FY99	$95,000	0.6
FY00	$100,000	0.6
FY01	$100,000	0.6

Schedule:

Start	*End*
FY92	Ongoing

Database: None

Publications: "Proceedings of the Acquisition Systems Protection Working Group," January 22–March 14, 1991, IDA Document D-962, April 1991

"Proceedings of the Acquisition Systems Protection Working Group," 28 March–30 May 1991, IDA Document D-1009, July 1991

"Proceedings of the Acquisition Systems Protection Working Group," 1 June–31 December 1991, IDA Document D-1172, January 1992

"Proceedings of the DoD Acquisition Systems Protection Workshop, 7–9 April 1992, Volume I—Summary; Volume II—Program Protection Planning Documents; Volume III—Background Documents," IDA Document D-1165, May 1992

"Proceedings of the Acquisition Systems Protection Working Group, 1 January–30 June 1992," IDA Document D-1208, July 1992

"Proceedings of the Acquisition Systems Protection Working Group, 1 July–31 December 1992," IDA Document D-1319, February 1993

"Proceedings of the DoD Acquisition Systems Protection Workshop, 27–30 April 1993. Volume I: Summary; Volume II: Background Documents," IDA Document D-1374, June 1993

"Proceedings of the Acquisition Systems Protection Working Group, 1 January–30 June 1993," IDA Document D-1394, July 1993

"Proceedings of the Acquisition Systems Protection Working Group, 1 July–31 December 1993," IDA Document D-1477, February 1994

"Proceedings of the Acquisition Systems Protection Working Group, 1 January–30 June 1994," IDA Document D-1578, October 1994

"Proceedings of the Acquisition Systems Protection Working Group, 1 July-31 December 1994," IDA Document D-1656, February 1995

"Proceedings of the Acquisition Systems Protection Working Group, January 1995–December 1996," Document D-2020, April 1997

"A Security and Counterintelligence Reference System," IDA Document D-2440, May 2000

Keywords: Analysis, Test and Evaluation, Security

IDA–26

Title: Cost of Stealth

Summary: The objective of this task is to estimate the cost of obtaining signature reduction for tactical aircraft through (1) adaptation of experiences gained by accomplished programs; and (2) technologies that will contribute to reductions in cost or signature in the future.

Classification: Top Secret/Proprietary Information/Special Access

Sponsor: USD(AT&L)
S&TS/AW
The Pentagon, Rm. 3E1081
Washington, DC 20301
Mr. Mutzelburg, (703) 695-0525

Performer: IDA
Dr. J. R. Nelson, (703) 845-2571, rnelson@ida.org

Resources:

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

Schedule:

Start	*End*
Oct 96	Sept 01

Database: Not available

Publications: Final Paper to sponsor in Sep 2001

Keywords: Government, Estimating, Analysis, Aircraft, SD&D, Production, Operations and Support, Schedule, Data Collection, Database, Method

IDA–27

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

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

Classification: Unclassified/Proprietary Information

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

Mr. Dean Gissendanner, (703) 695-7036

Performer: IDA
Dr. J. R. Nelson, (703) 845-2571, rnelson@ida.org

Resources:

FY	*Dollars*	*Staff-years*
99	$395,000	2.0

Schedule:

Start	*End*
Jan 99	Nov 99

Database: None

Publications: "Costs and Benefits of the Installation of Certain Flight Safety Systems on the F-22A Aircraft," IDA Paper P-3487, October 1999

Keywords: Government, Estimating, Analysis, Aircraft, SD&D, Production, Operations and Support, Schedule, Data Collection, Database, Method

IDA–28

Title: Technical and Schedule Risk Assessments for Tactical Aircraft Programs

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

Classification: Secret/Proprietary Information

Sponsor: USD(AT&L), S&TS/AW
The Pentagon, Rm. 3E1081
Washington, DC 20301
Mr. Dean Gissendanner, (703) 695-7036

Performer: IDA
Dr. J. R. Nelson, (703) 845-2571, rnelson@ida.org

Resources:

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

Schedule:

Start	*End*
Feb 92	Continuing

Database: N/A

Publications: TBD

Keywords: Government, Analysis, Aircraft, SD&D, Production, Schedule, Risk/Uncertainty, Data Collection, Database, Method

IDA–29

Title: US-China Cooperation in Cost Analysis

Summary: IDA and the China Institute for Aeronautical Systems Engineering (CIASE) have been cooperating since 1994 in jointly improving cost analysis capabilities. Under a Memorandum of Understanding, IDA and CIASE have and continue to exchange lectures on systems analysis, simulation-based acquisition and cost analysis. In addition, both are jointly working to estimate the cost of a medium-sized passenger commercial airliner that China is interested in developing and producing.

Classification: Unclassified

Sponsor: IDA
4850 Mark Center Drive
Alexandria, VA 22311-1882
Dr. J. R. Nelson, (703) 845-2571, rnelson@ida.org

Performer: IDA

Resources:	*FY*	*Dollars*	*Staff-years*
	02	$50,000	
Schedule:	*Start*	*End*	
	Jan 02	Dec 02	
Database:	None		
Publications:	None		
Keywords:	Estimating, Analysis, Life Cycle, Case Study		

IDA–30

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
Mr. Walt Cooper (703) 697-4312

Performer: IDA
Mr. Ronald E. Porten, (703) 845-2145, rporten@ida.org

Resources:

FY	*Dollars*	*Staff-years*
92	$ 40,000	0.3
93	$220,000	2.4
95	$130,000	1.0
96	$150,000	1.2
99	$250,000	1.5
00	$322,000	1.7
02	$ 80,000	0.3

Schedule:

Start	*End*
Sep 92	Oct 03

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: "Normalizing the Future Years Defense Program for Funding Policy Changes, 2000," IDA Paper P-3543, December 2000

"DoD Force & Infrastructure Categories: A FYDP-based Conceptual Model of Department of Defense Programs and Resources," IDA Paper P-3660, Draft Final February 2002

Keywords: Government, Programming, Forces, Mathematical Modeling, Computer Model

IDA–31

Title: FYDP Improvement, Phase II

Summary: This task studies program and budget data requirements, analyzes their similarities and differences, and recommends improvements.

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. Kevin Kelly, (703) 697-0223

Performer: IDA
Mr. Ronald E. Porten, (703) 845-2145, rporten@ida.org

Resources:

FY	*Dollars*	*Staff-years*
99	$400,000	2.1
00	$179,000	.9
01	$300,000	1.5
02	$355,000	1.4

Schedule:

Start	*End*
Aug 99	Oct 03

Database: *Title:* *Defense Programming Database*
Description: *Gathers and Organizes Programming Data for the Departmental Headquarters*
Automation: FYDP, MDAP

Publications: TBD

Keywords: Government, Programming, Forces, Infrastructure, Manpower/Personnel, Life Cycle, Automation, Data Collection, Database

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 a Master Production Schedule of 8 systems. Beginning August 1999 the study progressed to development of an optimization system for the Master Production Schedule of 80 ACAT1 systems. This system was developed in September 2000 and has been deployed to OUSD(AT&L). The system has since been modified for the addition of RDT&E. Currently the system is being maintained and has been updated with FY03 PB data.

Classification: Unclassified

Sponsor: OUSD(AT&L)
Dr. Nancy Spruill
Mr. Phil Rodgers (COTR)

Performer: IDA
Dr. Charles Weber (703) 845-6784, cweber@ida.org

Resources:

FY	*Dollars*	*Staff-years*
98	$90,000	0.5
99	$450,000	2.4
00	$1,200,000	5.6
01	$450,000	2.4
02	0	0.0

Schedule:

Start	*End*
Jun 98	Continuing

Database: *Title:* Portfolio Optimization Model Database
Description: Production profiles and costs for over 80 ACAT1 and pre-MDAP systems and over 40 production facilities.
Automation: MS ACCESS, Visual Basic, EXCEL

Publications: **"**Econometric Modeling of Acquisition Category I Systems at the Boeing Plant in St. Louis, Missouri," IDA Paper P-3548, December 2000

"Econometric Modeling of Acquisition Category I Systems at the Boeing Plant in St. Louis, Missouri–Revised," IDA Paper P-3548-Revised, June 2001

"Econometric Modeling of Acquisition Category I Systems at the Lockheed-Martin Plant in Marietta, Georgia," IDA Paper P-3590, July 2001

"Econometric Modeling of Acquisition Category I Systems at the Raytheon Plant in Tucson, Arizona," IDA Paper P-3648, Draft Final, June 2002

"The Feasibility of Applying Optimization Technology to Improve Long-Term Planning of Defense Acquisitions," IDA Document D-2385, forthcoming

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 program. IDA will also work with selected PFP countries to help strengthen their overall defense resource management processes. During these visits, IDA will work with the host country to improve the processes and organization arrangements developed by the host country to institutionalize its defense resource management system.

Classification: Unclassified

Sponsor: OD(PA&E), Regional Assessment and Modeling Division
The Pentagon, Rm. 2C270
Washington, DC 20301
Mr. Gary Morgan, (703) 697-6415

Performer: IDA
Mr. David A. Drake, (703) 845-2573, ddrake@ida.org

Resources:

FY	*Dollars*	*Staff-years*
93	$25,000	0.2
94	$288,000	1.9
95	$550,000	3.5
96	$800,000	5.0
97	$1,200,000	7.5
98	$1,100,000	6.9
99	$1,437,000	9.0
00	$1,690,000	10.6
01	$1,325,000	8.3
02	$2,165,000	12.0

Schedule:

Start	*End*
Sep 93	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/RR)
Director, Operational Test and Evaluation (DOT&E)
Suite 1000
4850 Mark Center Dr.
Alexandria, VA 22311
Mr. John Gehrig, (703) 681-4000 ext102

Performer: IDA
Mr. W. Andrew Wisdom, (703) 845-6962, awisdom@ida.org

Resources:

FY	*Dollars*	*Staff-years*
01	$50,000	0.25
02	$300,000	1.5

Schedule:

Start	*End*
Oct 01	Sep 02

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/RR)
Director, Operational Test and Evaluation (DOT&E)
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Alexandria, VA 22311
Mr. John Gehrig, (703) 681-4000 ext102

Performer: IDA
Mr. W. Andrew Wisdom, (703) 845-6962, awisdom@ida.org

Resources:	*FY*	*Dollars*	*Staff-years*
	00	$850,000	4.0
	01	$900,000	4.0
	02	$950,000	4.5
Schedule:	*Start*	*End*	
	Oct 01	Jan 03	
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. The current sectors being analyzed are Missiles/Precision Guided Munitions and Unmanned Aerial Vehicles. The task also provides rapid turnaround assessments of breaking issues, such as an industrial impact assessment in support of the V-22 review panel, and an assessment of the impact of a proposed merger of defense contractors. The task is also creating 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
Captain Robert Magee (703) 607-4045, Ms. Christine Fisher, (703) 601-5008
Ms. Dawana Branch, (703) 602-4324

Performer: IDA
Mr. James Woolsey, (703) 845-2133, jwoolsey@ida.org

Resources:	*FY*	*Dollars*	*Staff-years*
	01	$700K	3.7
	02	$1.69M	8.5
Schedule:	*Start*	*End*	
	Jan 01	Jan 03	
Database:	N/A		
Publications:	TBD		
Keywords:	Industry, Analysis, Infrastructure, Missiles, Production		

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 are being 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:

FY	*Dollars*	*Staff-years*
02	$20,000	

Schedule:

Start	*End*
Oct 01	Sep. 02

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
4850 Mark Center Drive
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Performer: IDA

Resources:

FY	*Dollars*	*Staff-years*
02	$10,000	

Schedule:

Start	*End*
Jan 02	May 02

Database: None

Publications: Course material

Keywords: Estimating, Analysis

References

[1] DoD Directive 5000.2-R, "Mandatory Procedures for MDAPs and MAIS Acquisition Programs," 11 May 1999.

[2] Stephen J. Balut and Kathryn L. Wilson, "The IDA Cost Research Symposium," Institute for Defense Analyses, Document D-647, August 1989.

[3] Stephen J. Balut and Kathryn L. Wilson, "1990 IDA Cost Research Symposium," Institute for Defense Analyses, Document D-828, August 1990.

[4] Stephen J. Balut and Kathryn L. Wilson, "The 1991 Cost Research Symposium," Institute for Defense Analyses, Document D-1003, July 1991.

[5] Stephen J. Balut, "The 1992 IDA Cost Research Symposium," Institute for Defense Analyses, Document D-1204, August 1992.

[6] Stephen J. Balut, "The 1993 IDA Cost Research Symposium," Institute for Defense Analyses, Document D-1414, August 1993.

[7] Stephen J. Balut, "The 1994 IDA Cost Research Symposium," Institute for Defense Analyses, Document D-1569, August 1994.

[8] Stephen J. Balut, "The 1995 IDA Cost Research Symposium," Institute for Defense Analyses, Document D-1754, August 1995.

[9] Stephen J. Balut, "The 1996 IDA Cost Research Symposium," Institute for Defense Analyses, Document D-1863, August 1996.

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[11] Stephen J. Balut, "The 1998 IDA Cost Research Symposium," Institute for Defense Analyses, Document D-2173, August 1998.

[12] Stephen J. Balut and Matthew Schaffer, "Defense Cost Research Projects and Plans, 1999," Institute for Defense Analyses, Document D-2345, August 1999.

[13] Stephen J. Balut, Vance Gordon, Deborah Cann, Richard Bishop, and Richard Collins, "Status of DoD's Capability to Estimate the Costs of

Weapon Systems: 1999 Update," Institute for Defense Analyses, Document D-2300, April 1999.

[14] Stephen J. Balut and Matthew Schaffer, "Defense Cost Research Projects and Plans, 2000," Institute for Defense Analyses, Document D-2494, September 2000.

[15] Stephen J. Balut, Matthew J. Schaffer, Lynn C. Davis, Leonard P. Cheshire, and David W. Henningsen "Defense Cost Research Projects and Capabilities, 2001," Institute for Defense Analyses, Document D-2611, September 2001.

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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 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 2002 IDA Cost Research Symposium was estimating the cost of transformation. This document presents annotated versions of presentations made by invited speakers 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.

15. SUBJECT TERMS
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