A Strategy for

Defense Acquisition Research

by
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"Change does not necessarily assure progress, but progress implacably requires change. Education is essential to change, for education creates both new wants and the ability to satisfy them."

- Henry Steele Commager

Acquisition Research Mission

Fifteen years after the fall of the Berlin Wall, the world is again experiencing a major shift in the geopolitical landscape. The collapse of the Soviet Union and the end of the Cold War have profoundly changed the nation's security environment. However, as the September 11th attacks demonstrated, new deadly challenges have emerged from terrorist networks and rogue states. Although none of these threats equal the destructive capabilities of the Soviet Union, their determination to obtain, and the greater likelihood that they will use, weapons of mass destruction, creates a more complex and dangerous security environment.

The Department of Defense (DoD) has also entered a transformative period—leveraging emerging technologies to develop a net-centric warfare capability[1]—while actively conducting military operations, throughout the spectrum of conflict, in support of

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[1]Adapting itself to fight warfare in the Information Age and preparing forces that use information superiority as a key weapon.

the global war on terror. As a result, DoD is struggling to meet these competing

requirements and reconcile the spending between traditional and new programs.

Therefore, creating a more efficient acquisition system is a top priority. High-quality

research in the area of acquisitions is necessary to catalyze positive and lasting changes to

improve performance, reduce acquisition cycle times, and reduce the costs of DoD

acquisitions, even as the Department confronts rapidly changing external and internal

environments. This report highlights some the forces that are acting to change the

environment including: budget constraints, a changing threat environment, technological

innovations, force transformation, human capital management, a shrinking industrial

base, and ethics; and then develops a strategy for acquisition research.

Allocating a minute percentage of the over $250 billion annual defense acquisition

budget to original, rigorous, and replicable acquisition research could have an

immeasurable impact on the Department. Such an investment could provide

improvements in both qualitative and quantitative measures, while better equipping

forces to effectively respond to the changing economic, technological, geo-political, and

threat environments in a faster and more cost-effective fashion.

Background

Nearly two-thirds of the total Defense budget is used for acquisitions that include:

funds for operations and maintenance of field equipment to ensure force readiness

(approx. $121 billion); procurement of major weapons systems or equipment such as

aircrafts and tactical vehicles (approx. $77 billion); and research, development, test and

evaluation of proposed and early stage weapons systems and development of support

technology (approx. $70 billion) (Report of the Committee on Appropriations   June 18,

2004). Given the importance of acquisitions, Congress, the U.S. Government

Accountability Office, and other experts have voiced concern that acquisition programs

and projects too often exceed schedule and budget estimates. Many also point out that the

process is too cumbersome to adequately meet rapidly changing priorities and

circumstances.

Efforts to reform DoD's acquisition processes are not a new concept. As far back as

the Revolutionary War, critics have referred to national defense acquisition practices as

primitive, hobbled by complex rules, and plagued by cost and schedule overruns. Figure

1 illustrates multiple reform initiatives attempted during the past half century. Prior to

1990, the majority of acquisition reform attempts were proposed in response to isolated

criminal incidents, public outcry of perceived wasteful purchases, or major weapons

systems cost overruns, and could best be characterized as primarily applying constraints

on the acquisition workforce's decision making ability (Cooper 2002). Most of these

early reform attempts were stymied by cultural resistance or ineffective implementation.

Such ineffective and misfocused reforms send the wrong message to the workforce and

have the potential to reduce interest in or acceptance of future reform initiatives.
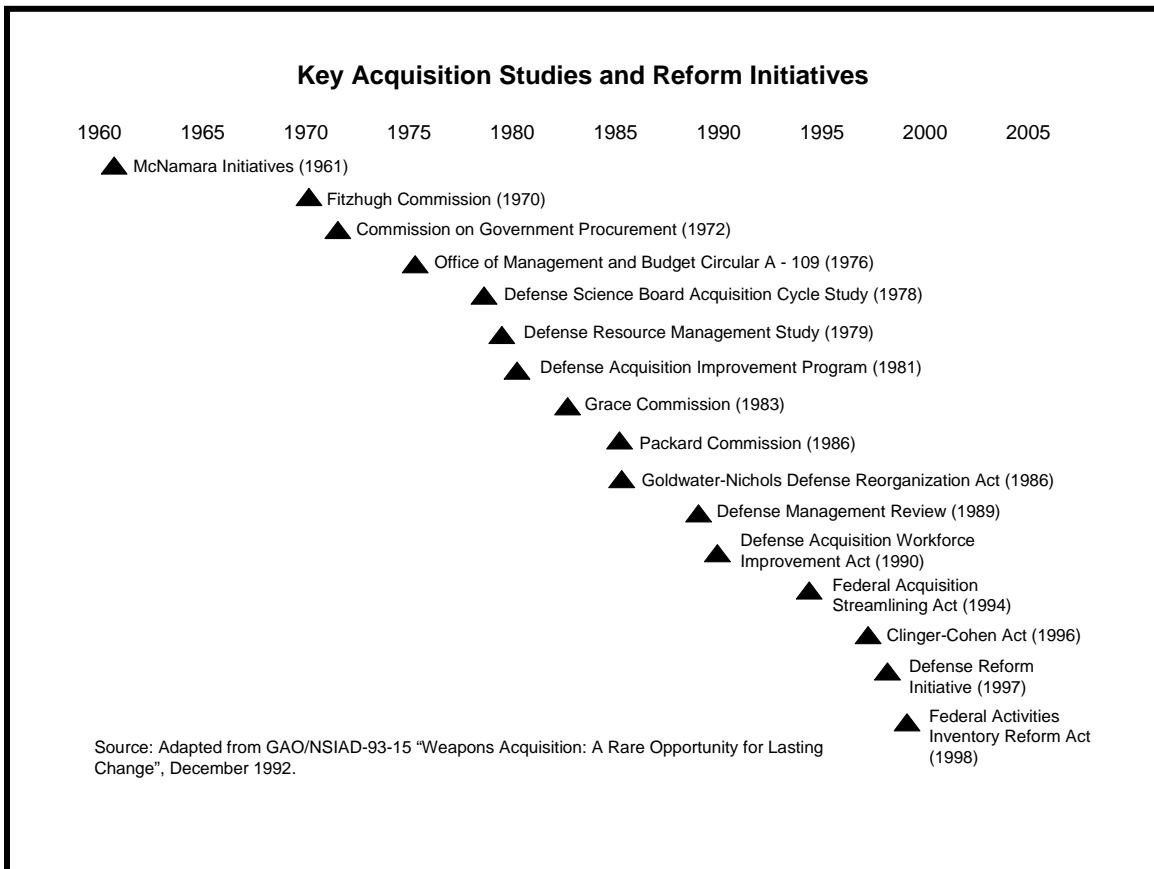
Key Acquisition Studies and Reform Initiatives

| 1960 | 1965 | 1970 | 1975 | 1980 | 1985 | 1990 | 1995 | 2000 | 2005 |

▲ McNamara Initiatives (1961)

▲ Fitzhugh Commission (1970)

▲ Commission on Government Procurement (1972)

▲ Office of Management and Budget Circular A - 109 (1976)

▲ Defense Science Board Acquisition Cycle Study (1978)

▲ Defense Resource Management Study (1979)

▲ Defense Acquisition Improvement Program (1981)

▲ Grace Commission (1983)

▲ Packard Commission (1986)

▲ Goldwater-Nichols Defense Reorganization Act (1986)

▲ Defense Management Review (1989)

▲ Defense Acquisition Workforce Improvement Act (1990)

▲ Federal Acquisition Streamlining Act (1994)

▲ Clinger-Cohen Act (1996)

▲ Defense Reform Initiative (1997)

▲ Federal Activities Inventory Reform Act (1998)

Source: Adapted from GAO/NSIAD-93-15 "Weapons Acquisition: A Rare Opportunity for Lasting Change", December 1992.

Figure 1. Acquisition Studies and Reform Initiatives 1960 - 1998

Modern acquisition reform attempts, beginning during the 1990s, echo findings from earlier panels that for 40 years have called for establishing flexible acquisition strategies, developing subsystems incrementally, establishing multiple decision points during program development, and improving professional development of acquisition personnel (Reeves 1996). However, the impetus for current reform has changed. Recent acquisition reform initiatives have attempted to realign acquisition practices with current technological and commercial realities. The potential for lasting reform may be greater if leaders can effectively communicate that these reforms are needed in response to the rapidly changing environment where flexibility and accountability in decision making are necessities.

In 1994, the Federal Acquisition Streamlining Act (FASA, P.L. 103-355) was signed into law. This law revised over 225 statutory requirements and condensed hundreds of laws into a unified procurement code. Key provisions of FASA included: (1) raising the threshold to $100,000 for the waiving of many statutes governing defense procurement; (2) streamlining the bid-protest process to prevent costly delays that could result when contractors protest procurement contract awards; (3) increasing to $500,000 the cap that would allow bidding defense contractors to bypass specialized accounting system requirements and avoid providing the government lengthy cost and pricing data (thus encouraging commercial suppliers to bid on defense business); (4) raising to $100,000 the value of contracts that could be reserved for small businesses; and (5) creating unified federal procurement statutes for executive branch agencies (Grasso 2002).

Smart reforms can have a dramatic effect. For example, increasing the small purchase threshold to $100,000 allows DoD to "use simplified procedures for 99 percent of our contract actions, which … account for only 16 percent of our dollars, freeing up our well-trained contracting officers and senior buyers to work on that 1 percent of our contracts that encompass 84 percent of our dollars," according to Colleen Preston, the first Deputy Under Secretary of Defense for Acquisition Reform (Ballenger 1995). FASA legislation also recommended pilot programs as a way to advance acquisition reform initiatives into a new era. Pilot programs benefit reform efforts by encouraging risk-taking and allowing the opportunity to take theory to practice on a few systems before directing wholesale, systematic change. These pilot programs will also help overcome reluctance to change by demonstrating near-term successes (Reeves 1996).

A second package of reforms, the Federal Acquisition Reform Act (FARA) of 1996, concentrated on the areas of competition, commercial items, and certification requirements. These reform provisions sought to simplify procedures to procure commercially available products and services. Reducing the emphasis on military-specific products allows DoD to take advantage of lower cost commercially-available goods that meet the needs of the Department and troops. The Act further reduced barriers to acquiring commercial products by eliminating the requirement for certified cost and pricing data; requirements that many private companies considered too expensive and prevented them from seeking out government contracts.

Although these reforms have introduced significant changes, there is little organized effort to research and evaluate their efficacy. As a result, reforms that are often put in place based on intuition and anecdotal evidence continue to influence acquisition processes, whether or not they achieve their desired objectives.

Status of Current Research

A disciplined, basic and applied research program is the only proven way to develop new theories and then use them to solve specific, practical questions within a knowledge domain—and the evaluate their effectiveness.

Currently, however, only extremely limited acquisition research is being conducted—primarily by internal DoD organizations, such as the Naval Postgraduate School, Defense Acquisition University, Air Force Institute of Technology, and DoD FFRDCs (e.g. Rand and LMI). Although these research projects offer valuable assessments of current practices and suggestions for improvements, the results are often limited in scope and may only address one specific problem at a time; often replicate

previous or parallel work; and generally have limited general application. These efforts

constitute only a fraction of the effort that is warranted by the size, complexity, and

changing nature of the DoD's acquisition challenges. They are not a substitute for

dedicated, replicable academic research.

While there are some parallels between defense acquisition and the private sector,

there are enough differences to suggest a need for dedicated interdisciplinary university

research that includes, but is not limited to, public policy or political science, business,

engineering, and computer science. However, virtually no acquisition research is funded

at leading research universities today. The Department should strive to provide funding

to researchers, residing within these traditional research outlets, to address this critical

imperative.

Such research would, of course, serve the additional function of developing a

cadre of both professors and graduate students skilled in the specialized knowledge of

defense acquisition—an area (because of the lack of such research) considerably lacking

today.

Some Broad Trends

Many broad trends within the acquisition community may considerably change the
acquisition environment and require a closer look:

■ *High, and growing, unit costs, longer product realization cycles, non-state-of-the-
art logistics*. The development of DoD weapon systems routinely costs more to
buy, takes much longer time to field, and requires more maintenance and logistics
support than is included in projected budgets. As a result, the buying power of
the department is reduced and required warfighting capabilities are delayed,

necessitating difficult trade-offs in production rates and total quantities bought. These decisions can then cause harmful ripples through other programs and defense requirements. The extended development times result in legacy systems remaining in the inventory for longer period and also result in systems fielded with near obsolete components that require refreshing soon after their initial deployment. These inefficiencies result in greater operations and support cost resulting in reduced funding available for modernization.

■ *Non-state-of-the-art business systems*. In the performance of its warfighting mission, DoD performs various business operations. These include the procurement of goods and services, the management of extensive logistic functions, management of both civilian and military human capital, management of a global healthcare system, as well as the financial management of an over $400 billion budget. Problems with these systems have resulted in the lack of reliable information for sound decision making, hampered operational efficiency, and have left the department vulnerable to fraud, waste, and abuse. DoD has recognized that its financial management systems do not provide information that is relevant, reliable, and timely, and has initiated a major effort to transform its management system. This effort, which began in 2001 has made little progress to date. Developing efficient and effective financial management systems are critical to the sound management of department resources.

■ *Inadequate equipment reliability.* DoD's warfighting mission places a high premium on weapon system readiness. There are two methods to achieve high readiness rates. The first is to develop and deploy highly reliable systems; the

second is to maintain a high-level logistics system that can provide spare parts and maintenance when they are needed. As a result, weapon systems with low reliability rates put an excessive burden on the logistics system and become very expensive to operate. Although DoD has initiated several efforts to reduce total life cycle cost, system developers continue to defer to technical performance requirements—trading off the operating and support costs—producing systems with poor reliability.

- *"Management" vs. "procurement".* The very nature of DoD acquisition is changing. Attention is shifting away from the traditional procurement of things to the management of contractors that are performing services. This shift will require program managers and procurement officers to have different skill sets, and levels of education training and maturity.

- *Judgment (with guidance) vs. rules.* The DoD acquisition system is extremely complex, and is already a major management challenge. Whenever a problem or "abuse" occurs, the natural tendency is to develop more rules and regulations. Making an already complex system more complex, even with the best of intentions, will not make the system more effective or help mitigate unanticipated problems. Recruiting and training highly qualified individuals, and then allowing them to exercise their judgment, with oversight, in pursuit of the program objectives may yield better results.

- *Best value vs. low bid.* The challenge and new charge is not simply to get cheaper services; but to get better services at lower costs. This approach is dramatically different than simply going to the "low bidder" who promises to meet "minimal

acceptable performance." This creates a new and difficult challenge for the

buying organization: it requires a serious value judgment in comparing potential

performance and costs for each of the bidders (public or private). In many cases it

also means the contract must be a *"performance-based contract,"* i.e., provides

broad performance objectives, but does not provide a detailed specification on

how to achieve it. Additionally, these contracts are more difficult to write, but

their structure is critical in getting the best value from the contractor.

■ *Competitive sourcing vs. in-house*. The nature of what the government does is

changing. In the past, the government has been the monopoly "doer" of things.

What is being asked of DoD is essentially what was demanded of US private

industry in the latter part of the 20th century in order to remain competitive. There

are many good examples of successful American businesses which have come to

rely on core competencies to do what they do best.[2] DoD can learn from their

successes to focus on public core competencies, such as policy, fiscal

management, oversight, and warfighting. For all other activities, the public sector

must rely more and more on competition to achieve higher performance at the

lowest cost and to get the "best value" from either the private or the public sector.

The current policy is to allow the private sector to compete against the

government employees for some of these functions; this has come to be known as

"competitive sourcing." When implementing competitive sourcing, regardless of

whether the public or private sector win these competitions, market forces are

introduced that, in the end, improve the performance and lower the cost. This is

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[2] Good examples are FEDEX, Caterpillar, Dell Computers, etc.

done using the OMB Circular A76, and other processes, including outsourcing, privatization, and public/private partnerships. The available data tend to show that we significantly improve performance (in some cases by orders of magnitude) and at the same time, on average, lower the cost by over 30%.

■ *Contractors in the combat zone*. DoD has come to rely on using contractors in security operations as a method to achieve more cost effectiveness in the military, to compensate for military personnel cuts, to use the technological expertise of contractors, and to allow for flexibility from congressional troop limits. These contractors provide military forces with a wide variety of services, ranging from logistics support (e.g., maintenance, housing, dining facilities) and training, to security services. These contracts are a form of contracting-out for services, yet because of the risks involved to individuals and corporations performing the services, they have many unique challenges and requirements.

Adapting to a Changing World

The acquisition needs, sources, strategies and process of the defense acquisition community are profoundly affected by the pressures and influences of a changing world. Budgetary pressures are increasing, and new national security issues have dramatically changed the environment in which the DoD operates. Efforts by the Office of Force Transformation, as well as changes in government workforce demographics will significantly affect how DoD does its business. A shrinking industrial base and important ethics concerns have a profound impact on the defense acquisition community.

Budgetary Pressures

The federal budget deficit is over $400 billion dollars, even when accounting for the current Social Security and Postal Service surpluses. The U.S. faces large and growing structural deficits largely due to demographic trends and rising health care costs.

Composition of Spending as a Share of GDP
Assuming Discretionary Spending Grows with GDP after 2005 and All Expiring Tax Provisions are Extended
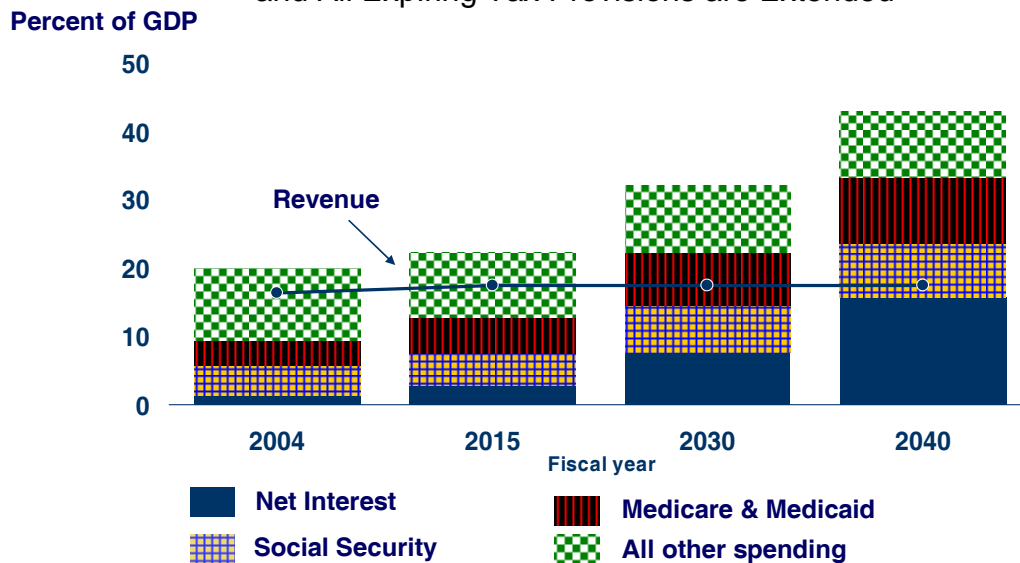
Notes: Although expiring tax provisions are extended, revenue as a share of GDP increases through 2015 due to (1) real bracket creep, (2) more taxpayers becoming subject to the AMT, and (3) increased revenue from tax-deferred retirement accounts. After 2015, revenue as a share of GDP is held constant.

Source: GAO's March 2005 analysis.

Figure 2. Potential Expansion of Government Deficit

Closing the current long-term fiscal gap based on responsible assumptions would require real average annual economic growth in the double digit range every year for the next 75 years. During the economic boom of the 1990s, the economy only grew at an average 3.2 percent per year. As a result, we cannot simply grow our way out of this problem. Following the status quo is not an option and tough choices will be required

(Walker 2005). Government agencies, including DoD, are likely to faced amplified budgetary pressures in the future.

The 2005 Defense Appropriations Bill totaled $401.7 billion in new budget authority for DoD, a 35 percent increase from 2001, but fell short of President Bush's request by over $1.5 billion (Report of the Committee on Appropriations, June 18, 2004; OMB 2004). Faced with multiple pressures including the demands of the war on terrorism, persistent budgetary deficits, and the need to protect Medicare and Social Security as the baby-boom generation retires, DoD cannot rely solely on budget increases to fund transformation. Lasting transformation of our nation's security posture will depend on the acquisition community working together to promote changes and cost savings *within* the Department, and throughout its supporting industrial structure, through cost cutting measures, leveraging civilian technologies, and implementing more efficient methods of production.

Commercial buying practices and purchasing supplies available to the general public have helped save money and lower overall acquisition costs. In recent years, the Defense Logistics Agency (DLA) has purchased high-quality commercial items (instead of military-standard items), which resulted in savings of more than 20 percent in medical supplies and 22 percent in clothing and textiles (based on a sample of more than $190 million worth of items) (National Defense Staff 1999). DoD can encourage additional acquisition reforms by funding a comprehensive research project challenging scholars, contractors, and military and civilian officials to find innovative ways to lower costs. Research should also encourage the evaluation of programs that help usher in fresh ways of thinking about acquisitions. Even if savings from a comprehensive research agenda

result in a conservative estimate of only one percent of DoD's annual acquisitions budget, this translates into cost savings of over \$2.7 billion ((\$400B * 2/3) *.01), suggesting that the potential benefits from a Department funded research agenda far outweigh the small costs of research and implementation.

Changing Environment

Today's national security environment is characterized by a great deal of uncertainty. The trend to globalization is an overwhelming force that has enabled new security challenges as terrorists, traffickers in illegal goods, and alien smugglers make use of the world's financial, communication, and transportation systems (Jacoby 2004). At the same time, the US continues to face states with traditional military forces and advanced systems, which can include cruise and ballistic missiles, that pose potential threats to national interests. To defeat this volatile mix of challenges will require new strategies, force structures, and technologies, should deterrence fail.

The potential for surprise comes from multiple fronts, and resources must be devoted to ensure broad situational awareness in order to quickly generate the needed intelligence on any security issue as disturbing trends or risks are identified (Jacoby 2004). Uneven economic and demographic development remains a source of instability. The poorest countries are almost universally those with the fastest growing populations and their economics and government services are not expanding fast enough to meet the demands of the population. This instability can foster pockets of terrorism and international crime. Rogue groups are finding that chemical and biological weapons are easier to develop, hide, and deploy than nuclear munitions. The supporting technologies are readily available and relatively inexpensive because they have legitimate roles in medical and

pharmaceutical industries (Jacoby 2004). Under the changing threat environment, weapons of mass destruction, including biological, chemical, and radiological threats, are "no longer the sole province of nation-states"(Tenet 2004).

The U.S. military has begun to focus on creating smaller, more adaptable fighting forces and creating stronger links with allied forces. These joint forces are taking on a greater role in promoting stability and reconstruction in areas of strife as seen in Iraq and Afghanistan.

DoD leaders recognize that the evolution of military action will be strongly influenced by the proliferation of information technologies, as well as the increasing pace of technological change. The legacy acquisition system, with decade long production cycles, will not keep pace with the changing threats or technological changes (available to potential adversaries), which demand improved performance, lower cost, and shorter cycle times. Some of the specific challenges that add to the uncertainty in the threat environment include the following:

■ *Asymmetric warfare*. Asymmetric warfare is a military concept describing conflicts in which the opponents have disparate military capabilities or tactics. In such situations, the militarily disadvantaged power must identify and employ its special advantages or effectively exploit its enemy's particular weaknesses if they are to have any hope of winning. Since the US has overwhelming conventional military power, adversaries will avoid direct force-on-force confrontations, and increasingly seek to employ asymmetric capabilities. State and non-state actors, that include terrorist networks and international criminal organizations, increasingly turn to asymmetric techniques to challenge the US. Such adversaries often attempt to

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target civilian populations, economic centers and symbolic locations as a way to attack US political will and resolve. US forces will need to be flexible and adaptive, using rapid prototyping and concept development to adapt to changing adversary initiatives.

- *Weapons proliferation*. Proliferation of advanced technologies and weapons will impact the nature of future conflicts. Many dual use technologies, such as global positioning systems, high resolution satellite imagery, and information technologies, are inexpensive and widely available commercially. These can be used to help plan and attack targets, both overseas and within the US. Information technologies also enable attacks on networks with impunity, carried out from safe havens overseas. Adversaries also have access to advanced weapon systems such as weapons of mass destruction and mobile surface-to-surface missile systems, that dramatically increase their capability to threaten US interests. This proliferation of weapons and technology has significant implications for military capabilities.

- *Short Technological Cycles.* The commercial world is rapidly developing new, and improved, technologies—particularly in the critically-important information and communication fields—where new systems appear in 18 month cycles and are available on a worldwide basis. If the DoD continues to have cycles for development and deployment of decades, it is clear that the U.S. military will be disadvantaged.

- *Net-centric Warfare*. Net-centric Warfare is the military concept of harnessing information technologies to provide commanders and combatants at every level

an unprecedented view of the battlefield. However, it is more than just incorporating the latest information technologies; it also addresses how missions are accomplished, how units are organized, how they relate to one another, and how they are efficiently and effectively supported. The concept is to shift from a platform-centric orientation to a net-centric orientation where all the military forces are networked. The simple but powerful idea is that shared information is a source of great military value. As the number of military users are added to the network, the value of the network increases dramatically. Networked weapons platforms, for example, may not need to have their own organic sensors, but would be able to take advantage of networked sensors.

■ *Threats to the Homeland.* The United States, from a national security perspective, is blessed with wonderful geography, and for much of its history there was little fear of being attacked at home. There was a 40-year period during the Cold War when there were Soviet bombers and ICBMs poised to attack US cites, but with the demise of the Soviet Union, the strategic arms reduction talks, and warming of relations with Russia, those threats diminished. However, the US now faces a range of adversaries that threaten the United States throughout a complex battlespace—it extends from critical regions overseas, spans international airspace, waters, space, cyberspace, and includes the homeland. In addition to increased rogue state military capabilities, recent terrorist threats and attacks have reminded us of our significant physical vulnerability to an adversary willing to employ unconventional tactics.

- *Stability and Reconstruction.* Current military capabilities allow US forces to use precision strike techniques that minimize collateral damage and, as demonstrated in Iraq, can conclude operations quickly. Although these precision techniques can leave large segments of the population unaffected, they can also leave large elements of the adversary's military undamaged. US forces may be called upon to operate and coordinate interagency reconstruction activities among a largely non-combatant population, with pockets of active enemy resistance in place.

Force Transformation

Changing threat environments, and the increasing use of unconventional methods of attack, require a change in the organization and capabilities of U.S. troops and our allies. The Office of Force Transformation within the Department of Defense has begun to explore and address issues of transformation of U.S. military capabilities ranging from instituting metrics to changing the culture of institutions, to creating new military capabilities (Cebrowski 2004). In April 2003, Secretary of Defense Donald Rumsfeld issued a Transformation Planning Guide identifying the critical elements of transformation, assigning roles and responsibilities for promoting transformation, and depicting the desired outcome of "fundamentally joint, network-centric, distributed forces capable of rapid decision superiority and massed effects across the battlespace" (DoD 2003).

This concept of leveraging information, as well as shared situational awareness and knowledge, to achieve situational dominance is called Network Centric Warfare (NCW) (DoD 2001). Transformation depends on enhancements to the physical and information domains to create a responsive system with improved performance and the ability to

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quickly move troops and equipment to crisis areas, while keeping in close communication with joint forces in disperse locations. Limited resources may require making the decision to forego currently planned systems and invest in capabilities to help reduce future risks instead. Acceptance from top leaders is a necessary condition for significant transformation, especially when they are asked to cut existing programs. DoD must make a concerted effort to educate leaders across the department as to why transformation from an industrial age to an information age military is critical to maintaining and strengthening U.S. military advantages (DoD 2003).

What is the impact of these changes on the acquisition community? The legacy DoD acquisition system, and structure of procurement and program offices, have been centered on platforms—ships, aircraft, tanks, etc. The new concepts that support transformation will require integration of these systems into "systems of systems." This challenge will require new and innovative approaches from the acquisition community to develop and refine management practices to acquire these integrated programs.

Government Workforce Demographics

The Department of Defense is facing a substantial human resources dilemma. Civilian employment has decreased by 36 percent—a reduction of over 375,000 employees—since 1989 (see Figure 3) (Office of the Under Secretary of Defense (PR) 2004). Figure 4 illustrates how DoD's lack of attention to force shaping during downsizing in the early 1990s has resulted in a workforce that is not balanced by age or experience. Such an imbalance may put the orderly transfer of institutional knowledge at risk.

Human capital challenges are even more severe in the acquisitions arena. DoD has downsized its acquisition workforce by nearly half, and more than 50 percent of the

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remaining workforce will be eligible to retire by 2005 (Walker 2003). The Department's

ability to effectively create and monitor acquisition programs will be negatively impacted

unless dramatic steps are taken to ensure the transfer of knowledge about government

acquisitions and client relationships.

Figure 3. Total DoD Civilian End Strength by Percent Change

Civilian Personnel Trends

Total strength fell 36% (376K people) between Sept 89–May 01

Civilian Personnel Trends: Civilian Age Bands
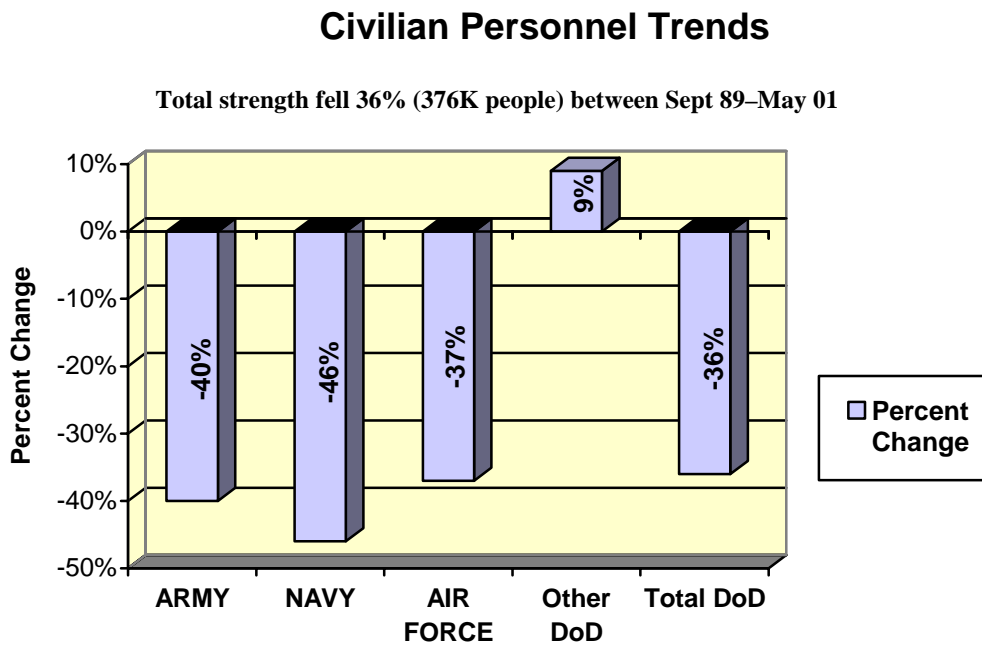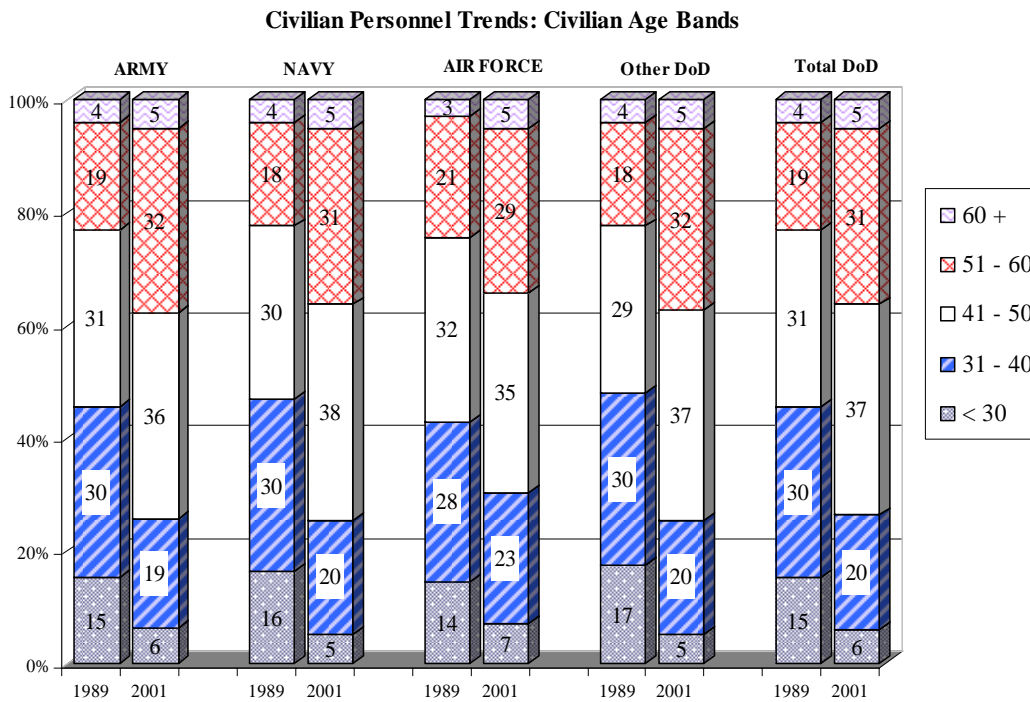
An aging workforce - vulnerability to retirement - future staffing needs

Figure 4. Total DoD Civilian End Strength by Age Band (Office of the Under Secretary of Defense (PR) 2004)

Job responsibilities are changing as well and will require new classifications and salary systems. The role of the government is shifting from being primarily the "provider" of goods and services to the role of being the "manager of the providers" (Gansler 2002). The changing world will require more emphasis on civilian education and training; today's ideal job candidates are critical thinkers, management oriented, and technologically capable. Acquisition professionals must understand the needs for competition and continuous improvement and be able to make sound decisions, even in crisis situations. Performance may improve as the department hires highly educated employees with technical skills to take the place of retiring baby-boomers. Rather than viewing the proportion of acquisition personnel nearing retirement age as a barrier,

replacing 25-30 percent of the acquisition workforce should be viewed as a valuable opportunity to aggressively recruit fresh thinking, information age personnel ready to tackle the acquisition realities of the 21st century (Giffard 2002).

Shrinking Industrial Base

Shrinking defense budgets in the 1990s resulted in a string of mergers of defense industry suppliers. In 1993, there were 21 companies doing major defense aerospace work; today there are six U.S. companies: Boeing, Lockheed Martin, BAE Systems, Raytheon, General Dynamics, and Northrop Grumman, as shown in Figure 5 (Linster 2002).

Small and large suppliers alike consider government accounting and reporting requirements burdensome and many have stopped bidding on government contracts, thereby reducing the stream of suppliers. The lack of qualified vendors became painfully obvious when, during the Gulf War, U.S. troops could not buy needed two-way Motorola radios because Motorola did not have an accounting system that met DoD's procurement regulations. In the end, the Japanese government bought the radios from Motorola directly and distributed them to American soldiers (Ballenger 1995).

Globalization has also changed the defense industry. The Department of Defense and defense contractors have begun to outsource work and form partnerships with foreign defense companies as a way to combine intellectual property, take advantage of economies of scale, and reduce costs. Some argue that consolidation of the defense industry leaves DoD with fewer options for competitive contracts, making it more difficult to ensure performance and cost requirements. Opponents also worry that

outsourcing may threaten the military supply chain and put national security at risk by relying on foreign companies for defense work.

As the monopsony buyer (only one buyer seeking products and services of several sellers) from an oligopoly set of suppliers (market with so few sellers that actions of any one affect price and competitors), it is DoD's responsibility to consider the structure of the industry. And the structure of that industry will determine the conduct and performance of that industry. If the structure is ignored, two or three wins in a row by one supplier may force the other supplier to consolidate or leave the defense industry, precluding future competition. In some of these consolidations, vertical integration is taking place. Another major acquisition issue for the future asks, can DoD assure that the prime contractor—transformed from platform suppliers to systems integrators—is holding an objective, independent assessment of his own supplier (at both the platform level and the lower tier) versus other suppliers. A major acquisition research challenge is to identify ways to assure such objectivity without having DoD assume the responsibility for a firm's make-or-buy decision.

Adapting to a changing world — Shrinking Industrial Base and Globalization

BOEING

LOCKHEED MARTIN

BAE SYSTEMS
North America

Raytheon

GENERAL DYNAMICS

NORTHROP GRUMMAN

Rockwell Defense & Aerospace
Boeing
McDonnell Douglas
Hughes Satellite Systems
General Dynamics Space
GE Aerospace
Martin Marietta
General Dynamics Ft. Worth
Lockheed
Loral
IBM Federal System
Unisys Defense
LM Sanders
LM Control Systems
Tracor
Convair
General Dynamics Electronics
Vitro
Marconi Electronic System
Chrysler Defense
E-Systems
Raytheon
Hughes Aircraft
Texas Instrument Electronics
Computing Devices International
Advanced Technology Systems
Lockheed Martin Armament
Bath Iron Works
General Dynamics
NASSCO Holdings
K-C Aviation
GTE Government Systems
Gulfstream Aerospace
Northrop
Grumman
Vought Aircraft
Westinghouse Defense
Logicon
Ryan Aeronautical
TASC
Sperry Marine
PRC
Litton Industries
Avondale

1993 1994 1995 1996 1997 1998 1999 2000 2001

Adapted from: *A Blueprint for Action* published in conjunction with the AIAA Defense Reform 2001 conference

Figure 5. Consolidation in the Defense Industry

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Ethics

Despite recent media and Congressional attention focused on revising business standards in the wake of the collapse of Enron and WorldCom, scandals are not limited to the private sector. Government acquisition officials feel caught between trying to keep projects under budget and on schedule while facing pressure to meet scores of rules and requirements mandated by DoD and Congress. The Department's reputation has been damaged by examples of unethical behavior ranging from the "Ill Wind," bribery and corruption scandal of the late 1980's, to the recent scandal involving former Air Force acquisitions chief Darleen Druyun and The Boeing Company. Cases of unethical practices involving DoD acquisition personnel demonstrate undesired consequences of the current system. Defense acquisition does not operate under free-market rules and mutual trust between the government and contractors is largely lacking. In the C-17 case, the Program Director purportedly mislead senior acquisition officials and promoted continued financial assistance to the Douglas Aircraft Company, despite cost overruns on a fixed-price contract, to ensure that the contractor continued progress on the C-17 airlifter (Heil 1994).

Strict oversight and investigators may help catch occasional cases of intentional wrongdoing, as was the case during the C-17 and "Ill Wind" scandals of the 1980s. However, tensions arise when restrictive oversight procedures slow down processes and increase costs, leaving acquisition officials frustrated and unsure of how to retain innovation and flexibility in a highly bureaucratic system. One estimate calculates that 25 percent of defense acquisition cost is due to unnecessary oversight, auditing, and

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regulations (Heil 1994). Extensive oversight and reporting requirements add extra layers of bureaucracy and contrast DoD's desire to increase flexibility in acquisitions. The Department must try to find the right balance between empowerment and oversight and must ask, "At what point does relying on laws and rules to ensure ethical behavior become more costly than the behaviors these rules aim to prevent?"

Controls

"Buy American" provisions, export controls, and restrictions on skilled foreign workers add another layer of external pressures that effect DoD acquisitions.

- ■ *Buy America.* Congress has passed a number of protectionist measures in an effort to keep jobs and industry in the U.S., as well as to promote security by having a domestic industrial base. The Buy American Act of 1933 is perhaps the most notable of such controls. The Act, with a few exceptions, requires that federal agencies procure domestically produced, mined, or manufactured articles, supplies, and materials for use in the U.S. Specific to the Department of Defense is the Berry Amendment, which compels DoD to purchase certain products—such as clothing and other textile items, specialty steel, and food—with 100 percent U.S. content and labor. While current trade agreements have resulted in the waiver of many "buy American" provisions, there have been recent legislative efforts attempting to close such loopholes. For example, Representative Duncan Hunter, Chairman of the House Armed Services Committee, introduced language to strengthen and expand the Berry and Buy American provisions in the House version of the FY 2004 DoD authorization bill. Such restrictions on what DoD can and cannot purchase, and from whom, compound the budgetary pressures

already bearing down on the Department and add a significant layer of complexity to the program manager's job.

- *Export Controls*. DoD is in the difficult position of attempting to strike a balance between the defense industry's push for deregulation with the very real need to keep weapons technology out of the hands of terrorists, rogue states, and other dangerous individuals and groups.   With the export of goods overseas, or when industries merge on an international scale, the technology and intellectual property become vulnerable to exploitation. Export control regulations,[3] while reasonably effective in controlling technology leaving the U.S., are difficult to enforce once the items are manufactured overseas. However, since U.S. forces are increasingly fighting side-by-side with allied forces (in joint coalitions) it is critically important that the allies equipment be state-of-the-art and interoperable with the equipment of U.S. forces. Thus, balancing export controls with sharing of technology becomes essential for maximum military capability.

- *Foreign Workers.* As the reliance on hiring skilled foreign workers grows, the U.S. Government has increased scrutiny on the access such workers have to sensitive information. This trend is yet another stress that DoD acquisition programs must withstand. Again, this is an area requiring a critical balance, as these skilled foreign workers both help to fill a growing shortage of U.S.

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[3] The Export Administration Regulation (EAR) administered by the Commerce Department bars the export of items, technology, and technical information found on the Commerce Control List to foreign countries without appropriate export license. EAR covers the transfer of dual-use commercial goods. The International Traffic in Arms Regulation (ITAR) is implemented by the Department of State. They regulate the export of items on the Munitions Control List and technical information about them.

engineers and scientist needed in the defense industry, and they often make many new and innovative contributions to next-generation U.S. weapon systems.

Considerable Constant Pressure

In a tight budget environment and a rapidly changing world, the acquisition area will be under increased pressure for improvement. Weapon systems and services often cost too much, take too long, and do not perform as well as planned. The hierarchical, risk-adverse, legacy acquisition system will not operate effectively in the new security environment. New evolutionary strategies that deliver capability in increments—incremental and spiral development—have been introduce to accelerate the acquisition process. With these strategies, contracts are written to specify the capabilities needed, not end requirements. This approach calls for extensive collaboration between the developer, user, and system tester to maintain a tight feedback loop so that new technologies or processes can be incorporated as they emerge. The process has been described as "build a little, test a little, build a little."(Jackson 2003)

Continuous improvement and user feedback loops are attempts to solve the problems of decade-long acquisition cycle times and strict contract requirements with detailed systems specifications, which, in the past, have led to final products that are outdated before they are ready for mass production. Ultimately, shorter cycle times will reduce costs and improve performance by keeping the budget and acquisition cycle time in line with the accelerating technological cycles.

Research Program Objectives

Research that evaluates existing policies, processes, and procedures and makes recommendations, then measures their effectiveness, can greatly improve DoD's acquisition program. The objectives of such research are threefold. First, the purpose is to initiate a wide-ranging acquisition research program that leverages both DoD resources as well as the broader academic community. Second, researchers will conduct high-quality, original research to identify, develop, and evaluate policies, procedures, and processes in order to improve DoD acquisitions. And finally, results will be published and presented in a variety of fora to reach, influence, and educate academics, policy makers, and acquisition professionals.

Possible Research Program Governance

A program management team is needed to promote and oversee further research in these areas. Our proposed structure would be to form an "Acquisition Research Steering Group" (ARSG), chaired by the Under Secretary of Defense for Acquisition, Technology, and Logistics, to approve broad research objectives and resources. Members of the ARSG would include Service Acquisition Executives, the Director of the Defense Logistics Agency, and the Director of Defense Acquisition University. An "External Acquisition Experts Advisory Group" would help tap into valuable knowledge and experience outside the agencies and Services to provide input for an ongoing research plan and related improvement efforts.

Based on the lead role that the Naval Postgraduate School (NPS) has taken in an effort to develop an external research program, and the fact that they are an academic, degree-granting institution used to peer-review processes, we believe they should be

appointed as the ARSG's executive agent. As executive agent NPS would be responsible for: (1) developing budgets and a detailed research plan based on the External Acquisition Experts Advisory Group's inputs and consistent with ARSG guidance; (2) soliciting, reviewing, and approving proposals using Broad Area Announcements and identifying peer reviewers using the NSF model; (3) managing ongoing research; (4) identifying appropriate products and distribution channels; and (5) providing ARSG with an annual report of activities and proposals for subsequent years. An initial allocation of $3 million annually would fund up to two dozen studies per year, which could provide high-quality research and recommendations needed for improving performance, reducing cycle time, and reducing costs. NPS would also work to publish and present results in a variety of channels to reach, influence, and educate academics, policy makers, and acquisition professionals.

Research Goals

Figure 6 illustrates a sample research and mission capability feedback loop. The purpose of this research is to leverage DoD resources in conjunction with those of the broader academic community to evaluate existing policies, processes, and procedures in order to improve acquisition processes overall, and thus enhance warfighting capabilities. Current examples of possible research objectives have been categorized into the following 11 major areas based on broad trends affecting DoD's acquisition strategy. Acquisition Processes

- Project Management
- System Engineering
- Logistics

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- ■ Human Capital

- ■ Industrial Base

- ■ Market-based Sourcing

- ■ Spiral Development

- ■ Use of Commercial Off-the-Shelf

- ■ Lifecycle

- ■ Cost and Schedule Estimation

Evaluate existing polices, processes, and procedures and make recommendations to:

DoD Acquisition Research Program

Improve Performance

Reduce Cycle Time

Reduce Costs

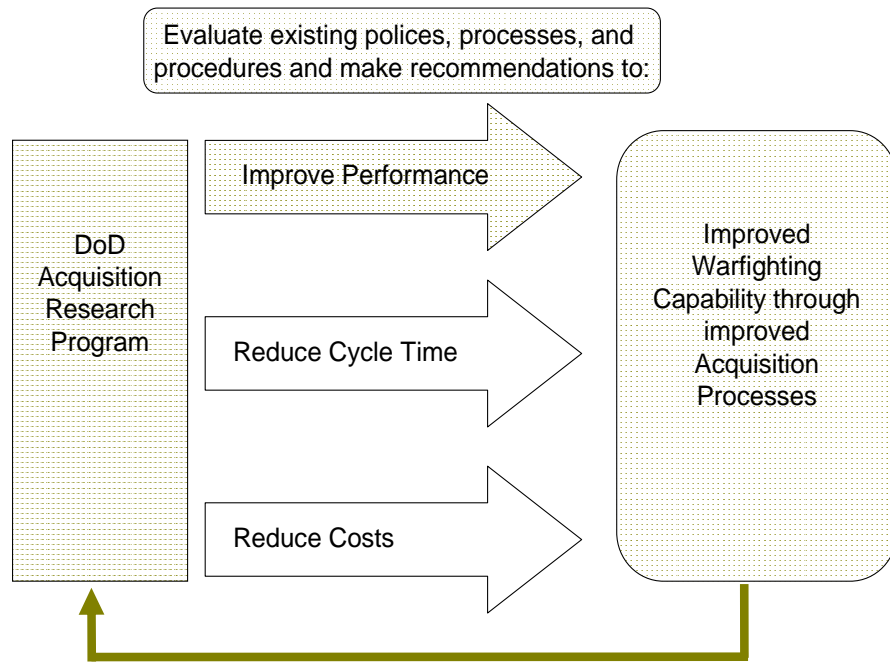Improved Warfighting Capability through improved Acquisition Processes

Figure 6. Research Goals

The following section discusses each major area and example objectives that target one or more of the overarching goals of improving performance, reducing cycle time, and reducing costs. A list of valuable research questions related to each of the areas discussed below can be found in Exhibit A.

Acquisition Processes

> **Example Objectives:**
>
> → Use contract types, past performance, and bundling as methods to improve performance.
> → Improve impact of e-government initiatives.
> → Develop timely metrics and feedback.
> → Contract for services rather than systems.

Improved performance relates to more than weapon system capabilities; there is room to improve the day-to-day guidelines and rules for acquiring services and components to increase speed and flexibility, reduce costs, and improve performance across the board. In recent years, performance based logistics, contracting for services rather than systems, and e-government initiatives have gained attention as preferred methods for improving performance of DoD acquisitions.

Performance based logistics applied to legacy systems and new contracts are often cited as an instrument to improve the acquisition process. Performance based logistics (PBL) includes flexible sustainment, but also incorporates direct vendor delivery (DVD), technology insertion, reliability-centered maintenance (RCM), process improvement, business re-engineering, and public/private partnering and teaming. The basis of PBL is establishing logistics performance requirements and contractual incentives to mitigate obsolescence and lower the cost of ownership (Naval Aviation Systems TEAM 2001).

Electronic government programs also offer the opportunity for innovation in the acquisition arena. Computers and e-government can be used to link people in remote locations and encourage real-time communication, and the expansion of e-government offers significant possibilities beyond automating processes to save money.

Research would also develop timely metrics and feedback in conjunction with these and other initiatives to gauge success. Managers often make better decisions when they analyze data to give them a clear picture of progress. The ability to spot trends helps managers become more responsive to internal and external changes in the acquisition environment. Instead of waiting for a project to end to implement lessons learned, managers can cut costs and improve performance by making adjustments along the way.

Project Management

> **Example Objectives:**
>
> → Clarify authority and responsibilities of Program Managers and encourage cultural change.
> → Evaluate resource allocation among multiple goals.

Expectations of program managers and contracting officials will evolve as the acquisition process changes. Clarifying the authority and responsibilities of managers will improve performance and likely have the secondary effect of reducing cycle time as processes are streamlined. Introducing flexibility and autonomy into the traditional procedures will help meet the ever-changing needs of today's military. A RAND report suggests that, "officials must operate in an environment that views an occasional unsuccessful project as an acceptable price for building a menu of new projects that can be used as a base for rapidly responding to new technological opportunities and new operational needs."(Birkler 2000) Managers with responsibility for an acquisition mission area mission should work with those assigned to organize, train, equip, and support the mission to generate continuous competition of ideas and methods for constant improvement.

System Engineering

Example Objectives:

→ Evaluate contractors and incorporation of commercial practices.
→ Ensure interoperability of hardware, software, organizations, and human capital.
→ Meet joint requirements.

Project managers are responsible for the successful management of people, processes, and now technology. The roles of information systems and technology are growing within the acquisitions field. Systems Engineering is expected to "provide expert advice to help identify and mitigate cost-schedule-performance risks and achieve program success" (Lockhart 2004). To assist with systems engineering, the Department instituted a systems engineering organization and has begun using Capability Maturity Model Integration (CMMI) to set policy for system implementation, training, and education and to help capture and institutionalize best practices across DoD. However, this system integration is still a work in progress. Rather than stopping improvements upon reaching "level X," work must be done to more fully promote CMMI as a means of continuous improvement for all programs (Schaeffer 2004).

Systems engineering may also be used to help acquisition personnel evaluate contractors' cost and schedule estimates. Public sector adoption of commercial practices and products are promoted as ways to build on existing knowledge to cut costs and reduce cycle time. But, this increasing reliance on commercial systems and contractors does not come without risks. Periodic evaluations of contractor performance must be conducted to help keep projects on schedule and may enable parties to catch problems early or adjust expectations. Interoperability of systems (hardware, software,

organizations, and human capital), combined with contractor oversight and the integration of commercial practices, are essential components of meeting the joint requirements set by the Department of Defense.

Logistics

> **Example Objectives:**
>
> → Transform logistics to better support the expeditionary forces.
> → Overcome internal resistance to introducing and incorporating modern logistics practices.

As requirements for the acquisition of equipment and services change, so too should the logistics systems that deliver these goods to end-users. Joint Vision 2020 suggests a transformation path from the current system to *focused logistics*, defined as "the ability to provide the joint force the right personnel, equipment, and supplies in the right place, at the right time, and in the right quantity, across the full range of military operations" (CJCS 2000).

This advanced logistics system will incorporate automated identification technologies to provide accurate counts and location information on assets as well as technology to provide real-time data to link multiple Service and support agencies. A seamless logistics pipelines improves operational effectiveness and efficiency while simultaneously reducing sustainment requirements and vulnerability to breaks in communication. Such shifts also make the acquisition processes a more intricate part of the logistics supply chain and require speed, efficiency, and precision. Additional research should be conducted that suggests ways to overcome internal resistance to incorporating these modern logistics practices.

Human Capital

Example Objectives:

→ Identify skills to manage future acquisitions successfully.
→ Determine needs for education and training.
→ Designate desired features of recruitment practices.
→ Consider ethics and the impacts of oversight.

Lasting transformation is impossible without meaningful acceptance from personnel at all levels. When leaders emphasize injecting innovative practices into the acquisitions and contracting arenas, they must be prepared to answer questions about what this means in terms of individual performance and job functions. As the acquisition process becomes more complex, the skills needed to perform these tasks also change. For example, evaluating best-value acquisitions is more complicated and demanding than fixed-price contracts (Looke 2003). Employees are increasingly expected to consider technological capabilities, performance history, and service agreements in addition to quoted prices when evaluating contracts. Thus, research aimed at identifying the skills to manage future acquisitions successfully is needed.

In general, people tend to shy away from tasks that could end in failure, and this makes it more difficult for leaders to encourage cultural change. In the federal government, incentives reinforce a low-risk culture and don't generally reward innovations, especially in government processes. Therefore, leaders must work to foster environments conducive to reform. Many acquisition professionals are keenly aware of the pressures and problems and if given the flexibility and encouragement to examine solutions more creatively, could provide some important advancements. Education and training programs can also help smooth the transition for many employees by, first,

exposing them to new techniques used in the commercial sector and other innovative

practices in acquisitions and, second, giving them an opportunity to learn techniques and

approaches to integrate these practices into their existing systems and procedures.

Managers also need to consider the changing acquisition profession and look at updating

systems of recruitment, hiring, rewards, and evaluation to realign them with the new

behaviors and practices required in the new environment.

Industrial Base

Example Objectives:

→ Investigate impact of industry consolidation and
   civilian/military integration in pricing and objectivity.
→ Examine effects of globalization on acquisitions and
   relationships with allies.

Falling expenditures for defense systems combined with an increasingly competitive

and global marketplace have spurred significant consolidation in the defense industry.

Defense companies have undergone mergers and acquisitions with former competitors in

an effort to take advantage of economies of scale while reducing overhead and inventory

costs. This is an area of great importance because as the number of contractors decrease,

DoD has fewer options for competitive contracts and it becomes more difficult to ensure

performance and costs requirements when no close substitutes exist. This consolidation

may also impact the objectivity of prime contractors when choosing sub-contractors.

Thus, research should investigate the impact of consolidation in pricing and objectivity.

In a progressively globalizing world, DoD has increasingly begun to consider

outsourcing defense work abroad as a new way to promote competition and lower costs.

Outsourcing enables DoD to acquire competitive goods from foreign companies at a

reduced cost and simultaneously encourages improvements in price and products from domestic producers. Despite the benefits of cost savings and improved performance, some experts worry that outsourcing may be too great a risk. The Department of Defense has less control over the supply chain when it must coordinate multiple producers in disperse geographic locations. For example, foreign governments could influence local suppliers and restrict trade with the United States as retaliation for U.S. foreign policy stances. The Department of Defense must evaluate these risks and find ways to secure reliable production and distribution when awarding contracts to foreign suppliers.

Market-based Sourcing

Example Objectives:

→ Evaluate use of market-based sourcing to support military operations and maintain competitive pressure.
→ Use incentives to overcoming internal resistance to change.
→ Establish best practices, targets, and goals.

Market-based or competitive sourcing was designated a major initiative under the 2001 Presidential Management Agenda. DoD has the largest program of market-based sourcing and the Department projects savings of over $6 billion from A-76 competitions completed between 2000 and 2003 (OMB 2003). Contrary to political rhetoric, recent data show that most claims of the negative impact of competitive sourcing on federal employees are unfounded. Of the 65,157 civilian positions "studied" (i.e. competitively sourced) since 1995, only 5 percent were reduced through involuntary separation; even though the savings averaged over 30% (Gansler 2004).

The Defense Department's ability to utilize market-based sourcing, to maintain high-quality operations and competitive pressure, will lead to improved performance and

reduced cycle time, in addition to reduced costs. Despite evidence that competitive

sourcing aids the Department in meeting its goals, additional research is needed to

establish best practices to increase the effectiveness of this sourcing strategy.

Spiral Development

> **Example Objectives:**
>
> → Analyze use of incremental development in private sector.
> → Use spiral development to improve the budget process, the
>   Test & Evaluation process, and the logistics process.
> → Lower risks, reduce cycle time, and cut costs.

The Department of Defense has begun emphasizing incremental and spiral

development, along with more flexible contracts in an effort to shorten acquisition cycle

times. Spiral, or evolutionary, development allows for high-level capabilities faster and at

lower cost by producing and deploying systems based on mature technologies. These

practices are especially beneficial for software intensive weapons programs. DoD

estimated that it spends about 40 percent of its Research, Development, Test, and

Evaluation budget on software—$21 billion for fiscal year 2003. Of this, 40 percent, or

$8 billion, was spent to rework software because of quality-related issues (GAO 2004a).

Catching problems early can shorten cycle time, reduce costs, and ultimately improve

performance of the development processes and the end products. Organizations that work

in an evolutionary environment, follow disciplined development processes, collect and

analyze meaningful metrics to measure progress, and are better equipped to improve their

software development processes on a continuous basis.

Utilizing these strategies and writing contracts specifying the capabilities needed

overtime—not just desired end results—can help program officers maintain a tight

feedback loop with contractors and allow both parties to design the solution piece by piece, making improvements as new technologies and processes become available. Incremental development attempts to solve the problems of decade-long cycle times and strict contracts mandating certain inputs, which, in the past, have led to final products that are outdated before being ready for mass production.

Use of Commercial Off-the-Shelf

Example Objectives:

→ Assess role of prior acquisition reforms in promoting commercial procurement.
→ Ensure acceptable environmental performance of COTS equipment.
→ Improve methods of measurement and oversight.

Commercial off-the-shelf (COTS) products are designed to be easily installed and interoperable with existing system components. Besides interoperability, two major advantages of COTS products are their availability and relatively low cost, which serve to reduce cycle time and expenses. The Federal Acquisition Streamlining Act (FASA) of 1994 and the Federal Acquisition Reform Act (FARA) of 1996 emphasized the use of commercial procurement but there is still room for improvement, especially in the area of software acquisitions. As of July 2004, GAO found that DoD's information technology (IT) business system acquisition policies and guidance fully incorporate 8 of the 18 best practices, partially incorporate 5 practices, and do not incorporate the remaining 5 practices, particularly those associated with acquiring commercial component-based business systems (GAO 2004b). The report argues that the DoD 5000 (acquisition) series policies do not provided effective controls for ensuring that best practices are

appropriately followed. Research into methods of measurement and oversight could help

promote increased acceptance and use of commercial products throughout the DoD.

Lifecycle

> **Example Objectives:**
>
> → Accelerate the concept through deployment cycle
> → Measure total life cycle costs.
> → Develop economic models to guide contractor incentives.

According to VADM (Ret.) Arthur Cebrowski, Director of the U.S. Office of Force

Transformation, "If program managers want their program to survive, they must solve

and resolve the riddle of why commercial cycle times are measured in weeks, months or

just a few years, while DoD's cycle time is measured in decades" (Giffard 2002).

Industry	Past	Current	Goal
Defense	132 months	102 months	< 66 months
Automobile	84 months	24 months	< 18 months
Commercial Aircraft	96 – 120 months	70 months	30 months
Commercial Spacecraft	96 months	18 months	12 months
Consumer Electronics	24 months	6 months	< 6 months

Figure 7. Comparison of Cycle Time Benchmarks
SOURCE: (Giffard 2002)

Despite recent changes to policy, including passage of FASA and FARA, there is no

systematic approach to measure the acquisition cycle time. Neither deployment nor

production cycle time is systematically considered and DoD cannot focus solely on the

development cycle time without consideration of the front or back end (Vollmecke 2004).

Further research is needed to determine more accurate methods of calculating total life

cycle times and costs that accurately reflect the expectations of the Office of Force

Transformation and the needs of today's soldiers. Today, there is extremely poor

visibility into the direct and indirect costs associated with the operations and support of

individual weapon systems—yet the totals for these costs have been rising rapidly.

Acquisition personnel would also benefit from economic models that guide contract

incentives in an effort to reduce cycle time and costs even in a market dominated by a

limited number of firms.

Cost and Schedule Estimation

> **Example Objectives:**
>
> → Improve quality and accuracy of estimates.
> → Evaluate tradeoffs between cost and scheduling.
> → Develop metrics for use in future contracts.

The majority of these broad trends are intertwined with other trends and are closely

related to cycle time and costs as well. Improving the quality and accuracy of estimates

for various metrics across subject areas will help DoD employees gain a more complete

understanding of the situations they face during this time of transformation. In some

cases, this may mean making tradeoffs between costs and scheduling. Can dollar amounts

be attached to contract delays or is there a way to rank the relative importance of meeting

schedule estimates as compared to meeting cost estimates? Are there projects where one

target goal is more important than another? Accurate measurements of cycle time and

costs help the acquisition workforce make better decisions. Over time, metrics should be

institutionalized and used to evaluate future contracts and improve efficiency across the

board.

Conclusion

The goal of researching and suggesting improvements to the acquisition process is to strengthen public confidence in the Defense Department and its ability to provide protection for taxpayers, and to realize, more rapidly, the high potential for improvements in performance, reduction in cycle time, and reduction in costs. Change is often resisted out of fear of the unknown. However, if DoD does not make substantial changes to respond to budgetary pressures and other external drivers, the department will find it increasingly difficult to modernize and transform its forces to face changing global threats. Expanding commercial acquisitions, utilizing models of continuous improvement, exploring the possibilities for interoperability, adjusting human capital practices, and ensuring a strong industrial base are just a few areas that will position the Department of Defense to meet the new challenges of the 21st century while using resources more efficiently. Linking with non-traditional partners, such as educational institutions, could also help DoD connect acquisition professionals with outside researchers or perhaps match practical problems with outside sources able to provide insight or solutions. These small investments in acquisition research have the potential to yield significant benefits and help acquisition officials overcome the challenges they can expect to face in the future. Moreover, a 10 percent improvement in the acquisition process (resulting from only, say, a $3 million per year investment in acquisition research) can free up approximately $25 billion per year (from an annual research and development, procurement, and support budget of over $250 billion) **while improving military capability**. How can we afford not to do it?

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Appendix A — Example Research Questions

I. Improve Performance

Acquisition Processes

- Requirements
    - What major differences exist between writing requirements for DoD acquisition contracts and private sector best practices?

    - What potential barriers exist to simplifying the process?

- Contract Types

    - How effective are the different contract types at producing performance that exceeds project goals?

    - How do contract types differ in promoting improved performance, lowering costs, and encouraging faster cycle times?

    - Are performance-based contracts more effective in acquiring services?

    - How does DoD define performance? How should it?

    - Is past performance an effective predictor of future performance? What role should past performance play when granting extensions or new contracts?

    - How does bundling of contracts impact small and disadvantaged business?

    - What are the benefits of bundling? What can be done to prevent the disadvantages?

- Maintaining the potential for competition after product or service awards

    - How can an acquisition strategy be implemented that maintains the potential for future competition (without the requirement to do so)?

    - What is DoD's recent history with competitive product support contracts?

- E-Government

- How has the implementation of e-government initiatives impacted acquisition performance? What has been the impact to performance and costs?

- How can e-government initiatives be used to catalyze the reengineering of acquisition processes?

o Metrics and Feedback

- Which metrics should be emphasized to better align DoD acquisition goals with long term strategic goals? How should these metrics be analyzed?

- Honest and timely feedback is a critical component of continuous improvement. What practices encourage productive feedback at all levels of the acquisition process?

- What non-financial performance criteria should be monitored? How should these be balanced?

o Contracting for services rather than systems – surge requirements

- What are the greatest challenges to awarding performance-based service contracts? How should these be addressed?

- A study by RAND found three key areas related to performance-based services acquisition (PBSA): teamwork, market research, and using past performance information. Do these key areas lead to improvements in PBSA? How are these principles practiced in the acquisition process?

- What are the most effective approaches to anticipate and satisfy services surge requirements?

o To what degree should the acquisition process be involved with what is developed and bought as opposed to just how it is done?

o Congress, as well as the DoD, has initiated many acquisition reforms. How effective have the recent efforts been? Have they achieved their objectives? What can be learned from these efforts to make future reforms more effective? For example, has Section 804 of the National Defense Authorization Act for FY 2003 (requiring a documented process for software acquisition planning, requirements development, project management, etc.) improved DoD's software acquisition process?

o What benefits and concerns do the following issues hold for the government when using a Lead Systems Integrator (LSI): maintaining competition; vertical integration; and the government's role?

Program Management

- o Organizational Issues

    - What should be the authority and responsibilities of a Life Cycle Program Manager? How should horizontal management be maintained?

    - Do barriers exist that preclude the Life Cycle Program Manager from exerting authority and responsibility? What must change to enable those authorities and responsibilities?

    - How should DoD's leadership encourage cultural change in the Department of Defense? Will these roles be different for political appointees, military, and civilian employees?

    - How will the use of networked organizations (within government organizations and between government and industry) affect DoD's acquisition processes?

- o Resource Allocation

    - What factors should be considered when prioritizing the equally important goals of improving/maintaining current weapons systems and developing new systems that support force transformation?

    - How are competing resource allocation priorities evaluated in relation to each other?

Systems Engineering

- o How can DoD incentivize industry to adopt and implement sound life cycle system engineering practices?

- o Should systems integration contractors be explicitly evaluated on their ability to implement commercial subsystems and components? What factors should be included in the evaluations?

- o Should systems integration contractors be independent of hardware suppliers?

o   How can acquisition plans prepare users for the impact that business processes that are embedded in the commercial components will have on their respective roles and responsibilities (e.g., warranties)?

o   Would including the status of identified risks in acquisition reviews improve cost, schedule, and performance results?

o   Integration to support transformation

   ▪   What are the most effective ways to integrate DoD's envisioned system of systems?

   ▪   What are the most effective ways to test these systems?

o   Interoperability

   ▪   As DoD moves toward a more network-centric force, what roles do hardware, software, organization, and human capital play in developing interoperability within the joint forces?

   ▪   What steps (e.g., individual incentives) should be taken during the acquisition process to increase compatibility and interoperability?

o   Cyber and Network Security

   ▪   Cyber-security remains an important issue; what actions should be taken to ensure secure network/communications among forces (including joint and coalition)?

o   Joint requirements

   ▪   How effectively does the current system respond to joint requirements? How can it be improved?

   ▪   How have technological, organizational, and conceptual innovations transformed the military? Civilian teams? What lessons are most useful to future DoD projects?

o   Test and Evaluation (T&E)

   ▪   How can the focus of T&E be shifted from a final exam to an integral part of the development process, yet still maintain objectivity and independence?

   ▪   How should T&E be performed on a system of systems?

   ▪   How should T&E be performed on special developments?

Logistics

- o How can DoD establish high reliability as an enforceable design requirement? What is DoD's recent history with reliability as a key performance parameter (KPP)?

- o How should logistics support be transformed to better support the expeditionary forces? The concept of net-centric warfare?

- o What technological gaps must be filled to achieve a joint end-to-end logistical process? Potential gaps may include: communication systems to connect the entire logistics force; ID tags to enable "in-transit" visibility of supplies; and the development of data standards so that a "single real-time logistics database can support all services and coalition allies in a secure environment."

- o How can the Department overcome internal resistance to introducing modern logistics practices?

Human Capital Issues

- o Required Skills

    - ▪ What combinations of skills (i.e., contracting expertise, project management experience, IT knowledge, etc) will be necessary to successfully manage future acquisitions?

    - ▪ Are current recruitment practices attracting and retaining employees with skills in alignment with the Department's strategy? How should they be modified?

    - ▪ How much do acquisition professionals need to know about the technology, capabilities, and operational environment of a system in order to develop effective acquisition strategies, plans, and processes?

    - ▪ In which respects are the competencies required to be a successful program manager the same for government and civilian projects?

- o Education and training

    - ▪ What acquisition skills, education, and training would best support the program manager in the future?

    - ▪ Do benefits from continuing education and training courses outweigh the costs?

    - ▪ How can acquisition research and education (including continuing education programs) be more closely integrated?

- o Recruitment

    - ▪ What recruitment practices should DoD employ? Would private sector hiring and/or employee training practices benefit DoD? What features should be included in future practices?

    - ▪ In the face of budget constraints and increased security concerns, what strategies should DoD use to effectively address the current human capital requirements?

- o Ethics considerations

    - ▪ How much oversight is required to maintain a highly ethical workforce? What methods of oversight are currently being practiced? Are they a necessary and efficient use of resources?

    - ▪ What is the impact associated with current DoD oversight and auditing designed to protect against unethical dealings in the acquisition process?

    - ▪ How effective have previous legislative actions been in curbing ethical lapses?

    - ▪ How should special issues regarding civilians—government employees and civilian contractors—on the battlefield be addressed? These issues may include experience, security, and military responsibility.

Industrial Base

- o Industry Consolidation

    - ▪ How should programs be structured so that markets effectively determine prices when there are only a few large suppliers (e.g., oligopoly) and only one buyer (e.g., monopsony)?

    - ▪ Should the DoD take any steps to ensure the survival of any of the remaining prime contractors? What about critical subcontractors?

    - ▪ With all of the vertical consolidation, are prime contractors making objective decisions when selecting sub-contractors? Are any changes required to ensure objectivity?

- o Civilian/Military Industrial Integration

- How does civilian/military industrial integration impact costs? What are the cost and risk impacts?

- Should civilian/military integration be encouraged; and, if so, how?

o Globalization
- What impacts has globalization had on DoD acquisition?

- What issues are associated with outsourcing DoD work abroad?

- What should DoD do to assure supply of critical technologies and products in the face of globalization?

- To what extent could (and should) defense acquisition procurements of equipment and processes from foreign countries be adapted for use in the US; and, if so, how?

- To what extent do future military successes depend upon cooperation and coordination with allied nations?

- How should export control rules and procedures be utilized to take advantage of benefits of cooperation while reducing risks?

Market-based Sourcing

o What is the impact of using market-based sourcing to support military operations?
- Can contractors effectively meet surge requirements?

- What steps should be taken to maintain competitive pressure?

o How does market-based sourcing affect performance and cost?

o What incentives can be utilized to overcome barriers to market-based sourcing, including internal resistance to change, political pressures, and reporting requirements?

II. Reduce Cycle Time

Acquisition Processes

- What does speed represent for acquisition projects? Is it a dependent variable resulting from other parameters or can it be managed independently?

- How should the impact of cycle time reduction be evaluated with respect to other project aspects such as cost and performance?

- What impact have Advanced Concept Technology Demonstrations (ACTDs) programs had on accelerating the weapon system development process? What are the most effective components of ACTD?

- Contract Type

  - How effective are contract incentives at producing performance that results in reduced cycle time?

  - Should past performance on cycle time be evaluated when granting extensions or new contracts? Which metrics should be used in these evaluations?

Spiral and Evolutionary Development

- How do spiral and evolutionary developments differ?

- How much does spiral development effectively reduce cycle time? Is it the same for evolutionary development?

- How is continuous improvement, or incremental development, used effectively in the private sector?

- What private sector practices should be adopted by DoD to enhance spiral development?

- When is spiral development advantageous? When is evolutionary development advantageous?

  - What is the impact of spiral development on the budget process, the requirements process, the Testing &Evaluation process, and the logistics process?
  - How should the requirements, budget, and T&E processes be changed to encourage spiral development?

  - What is the impact of spiral development on program management?

- How does time spent gathering data, examining options, and planning at the early stages impact cost and schedule?

    - Do results show that spiral development lowers risks, reduces cycle time to development, and cuts costs?

Use of COTS

- The Federal Acquisition Streamlining Act (FASA) of 1994 and the Federal Acquisition Reform Act (FARA) of 1996 emphasized the use of commercial procurement to lower costs and reduce cycle time. How have these reforms affected the use of COTS? Has the use of COTS improved schedule performance?

- What metrics should be used when evaluating the effectiveness of COTS?

- What steps should be taken to increase the use of COTS in future acquisition?

- Is there a link between cycle time and changes in the number and size of suppliers to DoD?

- What are the benefits of increased use of COTS? What are the implications for weapon design? What are the costs and risks?

- Advocates of increased Civil-Military Integration (CMI) believe that acquiring goods commercially will shorten development times, improve reliability and maintainability, and result in cost savings. Have recent CMI projects realized projected cost savings and improved reliability? How are these initiatives being implemented?

- What testing is required to assure high-quality, acceptable environmental performance of COTS equipment?

III. Reduce Cost

Lifecycle Logistics

o How should life cycle costs be effectively measured and evaluated?

o What is the impact of various perturbations in development on life cycle total ownership costs?

o What economic models are available to guide contract incentivization and reduce costs?

Market-Based Sourcing (e.g., competitive sourcing, outsourcing, public-private partnerships, privatization)

o Market-based sourcing of non-inherently-governmental work

■ What are the performance and cost impacts when using market-based sourcing?

■ What are the best practices to follow?

■ Which sourcing strategies result in greater savings?

■ When using competitive sourcing, should target goals for the number and size of competitions be established?

Cost and Schedule Estimation

o What steps can be taken to improve the quality of cost estimates?

o What techniques are available to increase accountability of life cycle management? Have DoD's efforts been effective in this regard?

o How should tradeoffs between cost and scheduling be measured? Explain instances in which each metric holds the advantage.

o Can the value of cost and schedule metrics be generalized into knowledge useful for future contracts?

o Measuring government costs

■ Evaluate the use of activity-based costing as a management tool for controlling and reducing government indirect costs.

A Strategy for Defense Acquisition Research

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Acquisition Research Mission

Conduct research to:

- **Better equip forces** to enable the DOD to respond to the changing economic, technological, geo-political and threat environments **in a faster and more cost-effective fashion**

- Improve performance, cost, and schedule results from an improved Department of Defense (DoD) Acquisition System;

Background

- Acquisition reform efforts of Congress
  - Federal Acquisition Streamlining Act, 1994
  - Federal Acquisition Reform Act, 1996
- Acquisition research
  - Little academic research being done
  - Some internal—NPS, DAU, AFIT

DoD spends over $200B a year on acquisition of goods and services, yet spends almost nothing on research to improve its acquisition processes

Some Broad Trends

- High, and growing, unit costs
- Longer product realization cycles
- Non-state-of-the-art logistics
- Non-state-of-the-art business systems
- Costs for services are very high
- Inadequate equipment reliability

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Many Broad Issues

- "Management" vs. "procurement"
- Judgment (with guidance) vs. rules
- Best value vs. low bid
- Competitive sourcing vs. in-house
- Dual-use suppliers vs. government-only
- Contractors in the combat zone
- Etc.

Adapting to a changing world (1)

- Budgetary Pressures
  - Persistent budgetary deficits
  - Demands of the War on Terrorism
  - Baby Boom Time Bomb — social security and Medicare
- Changing Environment
  - Asymmetric warfare
  - Weapons proliferation
  - Netcentric Warfare
  - Threats to the Homeland
  - Stability and Reconstruction

Adapting to a changing world (2)

- Force Transformation

  - Changing threat environments and the increasing use of unconventional methods of attack require a change in the organization and capabilities of U.S. troops and our allies.

  - New force to be "fundamentally-joint, network-centric, distributed forces, capable of rapid decision superiority and massed effects across the battlespace." (DoD)

Acquisition is a critical component of the military's plan to **affordably** and <u>**rapidly**</u> create highly-mobile, technologically-advanced fighting forces.

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Adapting to a changing world (3)

- Government Work force demographics
  - Civilian employment has decreased by 36 percent (a reduction of over 375,000 employees) since 1989
  - Lack of attention to force shaping during downsizing in the early 1990s has resulted in a workforce that is not balanced by age, skills, or experience
    - Could put the orderly transfer of institutional knowledge at risk
    - New skills will require new classifications and salaries
    - Changing world will require more emphasis on civilian education and training

Adapting to a changing world (4) — Shrinking Industrial Base and Globalization

BOEING

LOCKHEED MARTIN

BAE SYSTEMS
North America

Raytheon

GENERAL DYNAMICS

NORTHROP GRUMMAN

1993 1994 1995 1996 1997 1998 1999 2000 2001

Rockwell Defense & Aerospace
Boeing
McDonnell Douglas
Hughes Satellite Systems
General Dynamics Space
GE Aerospace
Martin Marietta
General Dynamics Ft. Worth
Lockheed
Loral
IBM Federal System
Unisys Defense
LM Sanders
LM Control Systems
Tracor
Convair
General Dynamics Electronics
Vitro
Marconi Electronic System
Chrysler Defense
E-Systems
Raytheon
Hughes Aircraft
Texas Instrument Electronics
Computing Devices International
Advanced Technology Systems
Lockheed Martin Armament
Bath Iron Works
General Dynamics
NASSCO Holdings
K-C Aviation
GTE Government Systems
Gulfstream Aerospace
Northrop
Grumman
Vought Aircraft
Westinghouse Defense
Logicon
Ryan Aeronautical
TASC
Sperry Marine
PRC
Litton Industries
Avondale

Adapted from: *A Blueprint for Action* published in conjunction with the AIAA Defense Reform 2001 conference

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Adapting to a changing world (5)

- Ethics
  - "ILL Wind" to Darleen Druyun
  - Finding the right balance between empowerment and oversight (judgment vs. rules)
- Controls on
  - foreign workers
  - Export controls
  - "buy American"

Considerable Current Pressure (DoD and Congress)

- Weapon systems and services:
  - Cost too much
  - Take too long
  - Often do not perform as well as planned

In a tight budget environment and a rapidly changing world, the acquisition area will be under increased pressure for improvement

Research Program Objectives

- Initiate a wide ranging acquisition research program that leverages both DoD resources as well as the broader academic community

- Conduct high-quality, original, research to identify, develop, and evaluate policies, procedures, and processes to improve DoD acquisition.

- Publish and present results in a variety of fora to reach, influence and educate academics, policy makers and acquisition professionals

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Possible Research Program Governance

- Acquisition Research Steering Group (ARSG) annually approves broad research objectives and resources for the next three years

  - Chaired by USD (A,T,&L)

  - Members Include Service Acquisition Executives, Director DLA, Director DAU

  - NPS as executive agent provides Executive Director and administrative support

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Possible Research Program Management

NPS — executive agent

- Develops budgets and a detailed research plan based on an "External Acquisition Experts Advisory Group," consistent with ARSG guidance
- Solicits, reviews, and approves proposals
  - Use Broad Area Announcements (BAAs)
  - Identifies peer reviewers and uses the NSF model to evaluate proposals
  - Funds appropriate proposals
  - $2 - 3M would fund around two dozen studies per year
- Manages ongoing research
- Identifies appropriate distribution channels
- Provides ARSG an annual report of activities, and proposals for subsequent years

Research Goals

Evaluate existing polices, processes, and procedures and make recommendations to:
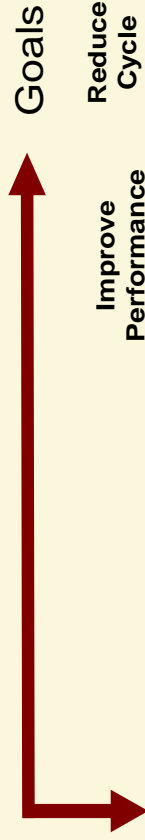
Improve Performance

Reduce Cycle Time

Reduce Costs

DoD Acquisition Research Program

Improved Warfighting Capability through improved Acquisition Processes
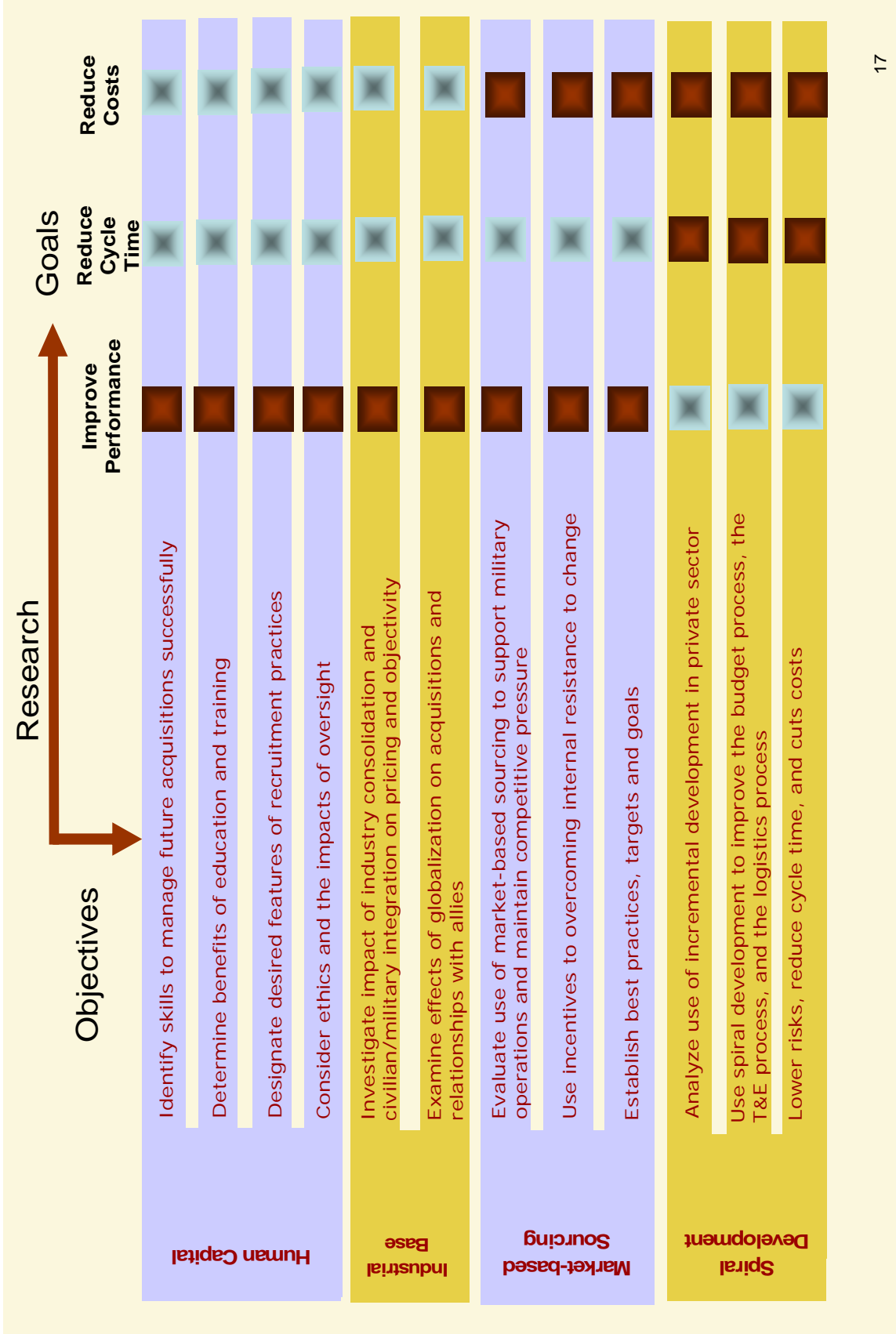
15

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Research

Objectives → **Goals**

	Improve Performance	Reduce Cycle Time	Reduce Costs
Acquisition Processes			
Use contract types, past performance, and bundling as methods to improve performance	Primary	Secondary	Secondary
Improve impact of e-government initiatives	Primary	Secondary	Secondary
Develop timely metrics and feedback	Primary	Secondary	Secondary
Contract for services rather than systems – surge requirements	Primary	Primary	Secondary
Program Management			
Clarify authority and responsibilities of Program Managers and encourage cultural change	Primary	Secondary	Secondary
Evaluate resource allocation among multiple goals	Primary	Secondary	Secondary
Systems Engineering			
Evaluate contractors and incorporation of commercial practices	Primary	Secondary	Secondary
Ensure interoperability of hardware, software, organizations and human capital	Primary	Secondary	Secondary
Meet joint requirements	Primary	Secondary	
Logistics			
Transform logistics to better support the expeditionary forces	Primary	Secondary	Secondary
Overcome internal resistance to introducing and incorporating modern logistics practices	Primary	Primary	Primary

Legend: ■ Primary Impact ⊠ Secondary Impact

Research

Objectives → Goals

Objectives	Improve Performance	Reduce Cycle Time	Reduce Costs
Human Capital			
Identify skills to manage future acquisitions successfully	■	X	X
Determine benefits of education and training	■	X	X
Designate desired features of recruitment practices	■	X	X
Consider ethics and the impacts of oversight	■	X	X
Industrial Base			
Investigate impact of industry consolidation and civilian/military integration on pricing and objectivity	■	X	X
Examine effects of globalization on acquisitions and relationships with allies	■	X	X
Market-based Sourcing			
Evaluate use of market-based sourcing to support military operations and maintain competitive pressure	■	X	■
Use incentives to overcoming internal resistance to change	■	X	■
Establish best practices, targets and goals	■	X	■
Spiral Development			
Analyze use of incremental development in private sector	X	■	■
Use spiral development to improve the budget process, the T&E process, and the logistics process	X	■	■
Lower risks, reduce cycle time, and cuts costs	X	■	■

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Sample Research Area and Questions

- **Acquisition Processes—Use <u>contract types</u>, <u>past performance</u>, and <u>bundling</u> as methods to improve performance.**

  - How effective are the different contract types at producing performance that exceeds project goals?

  - How do contract types differ in promoting improved performance, lowering costs, and encouraging faster cycle times?

  - Are performance-based contracts more effective in acquiring services?

  - Is past performance an effective predictor of future performance? What role should past performance play when granting extensions or new contracts?

  - How does bundling of contracts impact small and disadvantaged business?

  - What are the benefits of bundling? What can be done to prevent the disadvantages?

Conclusions

- Broad trends, budgetary pressures and other external drivers will continue to stress DoD's acquisition system.

- There are many potential approaches to improve performance, speed deliveries and reduce costs.

- Small investments in acquisition research could yield very significant benefits.

Final Thought

A 10% improvement in the acquisition process (resulting from $3 Million per year of acquisition research) can free up over $25 Billion per year (from an annual R&D, Procurement, and support budget of over $250 Billion) while improving military capability.

How can we afford not to do it?