



## Calhoun: The NPS Institutional Archive

---

Theses and Dissertations

Thesis Collection

---

2012-09

# The Evolution of the Contract Type Used in Defense Acquisition with a Focus on Major Defense Weapon Systems

Choe, Chinyong

Monterey, California. Naval Postgraduate School



Calhoun is a project of the Dudley Knox Library at NPS, furthering the precepts and goals of open government and government transparency. All information contained herein has been approved for release by the NPS Public Affairs Officer.

**Dudley Knox Library / Naval Postgraduate School**  
**411 Dyer Road / 1 University Circle**  
**Monterey, California USA 93943**

<http://www.nps.edu/library>



**NAVAL  
POSTGRADUATE  
SCHOOL**

**MONTEREY, CALIFORNIA**

---

**MBA PROFESSIONAL REPORT**

---

**The Evolution of the Contract Type Used in Defense Acquisition  
with a Focus on Major Defense Weapon Systems**

---

**By: Douglas M. Quinn and  
Chinyong Choe  
September 2012**

**Advisors: Bryan Lundgren,  
Max Kidalov**

*Approved for public release; distribution is unlimited*

THIS PAGE INTENTIONALLY LEFT BLANK

<b>REPORT DOCUMENTATION PAGE</b>			<i>Form Approved OMB No. 0704-0188</i>
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington DC 20503.			
<b>1. AGENCY USE ONLY (Leave blank)</b>	<b>2. REPORT DATE</b> September 2012	<b>3. REPORT TYPE AND DATES COVERED</b> MBA Professional Report	
<b>4. TITLE AND SUBTITLE</b> The Evolution of the Contract Type Used in Defense Acquisition with a Focus on Major Defense Weapon Systems		<b>5. FUNDING NUMBERS</b>	
<b>6. AUTHOR(S)</b> Chinyong Choe and Doug Quinn		<b>8. PERFORMING ORGANIZATION REPORT NUMBER</b>	
<b>7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)</b> Naval Postgraduate School Monterey, CA 93943-5000		<b>10. SPONSORING/MONITORING AGENCY REPORT NUMBER</b>	
<b>9. SPONSORING /MONITORING AGENCY NAME(S) AND ADDRESS(ES)</b> N/A		<b>11. SUPPLEMENTARY NOTES</b> The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government. IRB Protocol number _____N/A_____.	
<b>12a. DISTRIBUTION / AVAILABILITY STATEMENT</b> Approved for public release; distribution is unlimited		<b>12b. DISTRIBUTION CODE</b> A	
<b>13. ABSTRACT (maximum 200 words)</b> The goal in this project was to research and write an historical overview of the Department of Defense (DoD) Acquisition policy toward preference in a particular contract type. Major milestones and representative case studies were reviewed that challenge the current acquisition policy in regard to the type of contract selected for major defense weapon systems.  In this project, historical and analytical accounts of the defense acquisition process are provided for major weapon systems from 1947 to present. Significant changes were examined to acquisition policies to show any possible trends. Major studies were conducted to determine what factors contribute to policy changes associated with noteworthy cases involving major weapon systems.  By highlighting trends and making insightful observations, we hope to provide acquisition professionals who work with major weapon systems with greater perspective and context on the debate over the most appropriate contract type for use in major weapon systems.			
<b>14. SUBJECT TERMS</b> Contract Type, Major Weapon Systems, Fixed Price, Cost Reimbursement, Acquisition Initiatives, Defense Contracting, Trends, Policies			<b>15. NUMBER OF PAGES</b> 109
			<b>16. PRICE CODE</b>
<b>17. SECURITY CLASSIFICATION OF REPORT</b> Unclassified	<b>18. SECURITY CLASSIFICATION OF THIS PAGE</b> Unclassified	<b>19. SECURITY CLASSIFICATION OF ABSTRACT</b> Unclassified	<b>20. LIMITATION OF ABSTRACT</b> UU

THIS PAGE INTENTIONALLY LEFT BLANK

**Approved for public release; distribution is unlimited**

**THE EVOLUTION OF THE CONTRACT TYPE USED IN DEFENSE  
ACQUISITION WITH A FOCUS ON MAJOR DEFENSE WEAPON SYSTEMS**

Douglas M. Quinn, Lieutenant, United States Navy  
Chinyong Choe, Lieutenant Commander, United States Navy

Submitted in partial fulfillment of the requirements for the degree of

**MASTER OF BUSINESS ADMINISTRATION**

from the

**NAVAL POSTGRADUATE SCHOOL  
September 2012**

Authors:

\_\_\_\_\_  
Douglas M. Quinn

\_\_\_\_\_  
Chinyong Choe

Approved by:

\_\_\_\_\_  
Bryan Lundgren, Lead Advisor

\_\_\_\_\_  
Max Kidalov, Support Advisor

\_\_\_\_\_  
William Gates, Dean  
Graduate School of Business and Public Policy

THIS PAGE INTENTIONALLY LEFT BLANK

**THE EVOLUTION OF THE CONTRACT TYPE  
USED IN DEFENSE ACQUISITION  
WITH A FOCUS ON MAJOR DEFENSE WEAPON SYSTEMS**

**ABSTRACT**

The goal in this project was to research and write an historical overview of the Department of Defense (DoD) Acquisition policy toward preference in a particular contract type. Major milestones and representative case studies were reviewed that challenge the current acquisition policy in regard to the type of contract selected for major defense weapon systems.

In this project, historical and analytical accounts of the defense acquisition process are provided for major weapon systems from 1947 to present. Significant changes were examined to acquisition policies to show any possible trends. Major studies were conducted to determine what factors contribute to policy changes associated with noteworthy cases involving major weapon systems.

By highlighting trends and making insightful observations, we hope to provide acquisition professionals who work with major weapon systems with greater perspective and context on the debate over the most appropriate contract type for use in major weapon systems.



THIS PAGE INTENTIONALLY LEFT BLANK

## TABLE OF CONTENTS

<b>I.</b>	<b>INTRODUCTION.....</b>	<b>1</b>
	<b>A. BACKGROUND .....</b>	<b>1</b>
	<b>B. OBJECTIVE OF THE RESEARCH .....</b>	<b>3</b>
	<b>C. RESEARCH QUESTIONS .....</b>	<b>3</b>
	<b>D. METHODOLOGY .....</b>	<b>4</b>
	<b>E. SCOPE AND LIMITATIONS.....</b>	<b>4</b>
<b>II.</b>	<b>LITERATURE REVIEW .....</b>	<b>7</b>
	<b>A. INTRODUCTION.....</b>	<b>7</b>
	<b>B. TYPES OF CONTRACTS.....</b>	<b>10</b>
	<b>1. Fixed-Price (FP) Contracts .....</b>	<b>10</b>
	<b>2. Cost-Reimbursement (CR) Contracts.....</b>	<b>11</b>
	<b>C. WHAT IS A WEAPON SYSTEM?.....</b>	<b>12</b>
	<b>D. DEPARTMENT OF DEFENSE ACQUISITION.....</b>	<b>13</b>
	<b>E. SUMMARY .....</b>	<b>13</b>
<b>III.</b>	<b>THE DEFENSE MARKETPLACE .....</b>	<b>15</b>
	<b>A. DEFENSE INDUSTRY OVERVIEW.....</b>	<b>15</b>
	<b>B. DEVELOPMENT OF THE U.S. DEFENSE INDUSTRY .....</b>	<b>16</b>
	<b>1. Watts’ Growth Period: 1948–1960 .....</b>	<b>16</b>
	<b>2. Watts’ Mature Period: 1961–1990 .....</b>	<b>17</b>
	<b>3. Watt’s Restructuring Period: 1991–2007 .....</b>	<b>17</b>
	<b>4. The U.S. Defense Industry Today.....</b>	<b>18</b>
<b>IV.</b>	<b>CONTRACT TYPE TRENDS.....</b>	<b>19</b>
	<b>A 1947–1964: CR PERIOD, THE POST WORLD WAR II PERIOD .....</b>	<b>19</b>
	<b>1. Background .....</b>	<b>19</b>
	<i>a. Defense Environment .....</i>	<i>19</i>
	<i>b. Industry Environment.....</i>	<i>19</i>
	<b>2. Cost Reimbursement .....</b>	<b>20</b>
	<b>3. Significant Case: General Dynamic’s F-111 Aardvark.....</b>	<b>21</b>
	<b>4. Acquisition Reform Initiatives.....</b>	<b>22</b>
	<i>a. First Hoover Commission, 1949.....</i>	<i>22</i>
	<i>b. Second Hoover Commission, 1955.....</i>	<i>22</i>
	<i>c. The Weapons Acquisition Process Study by the Harvard Business School, 1962 and 1964 .....</i>	<i>23</i>
	<i>d. The Truth in Negotiations Act (TINA), Public Law 87 653, 1962.....</i>	<i>24</i>
	<b>B 1965–1969: FP PERIOD, THE TOTAL PACKAGE PROCUREMENT PERIOD .....</b>	<b>24</b>
	<b>1. Background .....</b>	<b>24</b>
	<i>a. Defense Environment .....</i>	<i>24</i>
	<i>b. Industry Environment.....</i>	<i>25</i>
	<b>2. Fixed Price .....</b>	<b>25</b>

	3.	Significant Cases: Lockheed C-5A Galaxy .....	26
	4.	Acquisition Reform Initiatives.....	27
C.		1970–1980: CR PERIOD, THE POST MCNAMARA PERIOD.....	27
	1.	Background .....	27
		a. <i>Defense Environment</i> .....	27
		b. <i>Industry Environment</i> .....	28
	2.	Cost Reimbursement .....	29
	3.	Significant Cases: F/A-18 Hornet .....	29
	4.	Acquisition Reform Initiatives.....	30
		a. <i>Blue Ribbon Defense Panel (Fitzhugh Commission), 1970</i> ..	30
		b. <i>Commission on Government Procurement, 1972</i> .....	30
		c. <i>Arming America: How the U.S. Buys Weapons, by J. Ronald Fox, 1974</i> .....	31
		d. <i>The Defense Resources Board, 1979</i> .....	31
		e. <i>The DoD Resources Management Study, 1979</i> .....	31
D.		1981–1990: FP PERIOD, THE REAGAN BUILDUP PERIOD .....	32
	1.	Background .....	32
		a. <i>Defense Environment</i> .....	32
		b. <i>Industry Environment</i> .....	32
	2.	Fixed Price .....	33
	3.	Significant Case: A-12 Avenger II.....	34
	4.	Acquisition Reform Initiatives.....	34
		a. <i>The Carlucci 32 Acquisition Initiatives, 1981</i> .....	34
		b. <i>Special Panel on Defense Procurement, 1982</i> .....	35
		c. <i>The Defense Industry, by Jacques S. Gansler, 1982</i> .....	35
		d. <i>Grace Commission, 1983</i> .....	35
		e. <i>The Competition in Contracting Act, 1984</i> .....	36
		f. <i>President’s Blue Ribbon Commission on Defense Management (Packard Commission), 1986</i> .....	36
		g. <i>The Defense Management Challenge, by J. R. Fox, 1988</i> ....	36
		h. <i>Affording Defense, by Jacques S. Gansler, 1989</i> .....	37
		i. <i>New Weapons, Old Politics, by Thomas L. McNaugher, 1989</i> .....	37
		j. <i>Defense Acquisition Workforce Improvement Act (DAWIA), 1990</i> .....	37
E.		1991–2008: CR PERIOD, THE POST COLD WAR PERIOD .....	38
	1.	Background .....	38
		a. <i>Defense Environment</i> .....	38
		b. <i>Industry Environment</i> .....	38
	2.	Cost Reimbursement .....	39
	3.	Significant Case: F-35 Joint Strike Fighter .....	39
	4.	Acquisition Reform Initiatives.....	40
		a. <i>Advisory Panel on Streamlining and Codifying Acquisition Laws Pursuant to Section 800 of the National Defense Authorization Act for Fiscal Year 1991</i> .....	40

	b.	<i>National Performance Review (NPR), 1993</i> .....	41
	c.	<i>Defense Science Board (DSB) Defense Acquisition Reform Study (Phase I), 1993</i> .....	41
	d.	<i>Defense Science Board (DSB) Defense Acquisition Reform Study (Phase II), 1994</i> .....	41
	e.	<i>Federal Acquisition Streamlining Act (FASA) of 1994</i> .....	42
	f.	<i>Defense Conversion, by Jacques S. Gansler, 1996</i> .....	42
	g.	<i>Defense Science Board (DSB) Defense Acquisition Reform Study (Phase III), 1996</i> .....	43
	h.	<i>Clinger-Cohen Act of 1996</i> .....	43
	i.	<i>Reexamining Military Acquisition Reform, RAND Corp., 2005</i> .....	44
	j.	<i>Comparative History of DoD Management Reform, NPS, 2006</i> .....	44
	k.	<i>OSD Defense Acquisition Performance Assessment (DAPA), 2006</i> .....	45
	l.	<i>John Warner Defense Authorization Act of 2007</i> .....	45
	m.	<i>Commission on Army Acquisition and Program Management in Expeditionary Operations, 2007</i> .....	45
	n.	<i>Defense Acquisition: Options for Congress, CRS, by Stephen Chadwick, 2007</i> .....	45
<b>F.</b>		<b>2009–PRESENT: FP PERIOD, THE PRESENT PERIOD</b> .....	<b>46</b>
	1.	<b>Background</b> .....	<b>46</b>
		a. <i>Defense Environment</i> .....	46
		b. <i>Industry Environment</i> .....	46
	2.	<b>Fixed Price</b> .....	<b>46</b>
	3.	<b>Acquisition Reform Initiatives</b> .....	<b>47</b>
		a. <i>National Defense Authorization Act (H.R. 4986/P.L. 110–181), 2008</i> .....	47
		b. <i>DoD Instruction 5000.2, 2008</i> .....	47
		c. <i>Joint Capabilities Integration and Development System (CJCSI 3170.01G), 2009</i> .....	47
		d. <i>Weapon Systems Acquisition Reform Act of 2009</i> .....	48
		e. <i>DSB: Creating a DoD Strategic Acquisition Platform, 2009</i> .....	48
		f. <i>CNA Independent Assessment: Air Force Acquisition, 2009</i> .....	49
		g. <i>Implementing Management for Performance and Related Reforms to Obtain Value in Every Acquisition (IMPROVE) Acquisition Act of 2010</i> .....	49
<b>V.</b>		<b>ANALYSIS</b> .....	<b>51</b>
	<b>A.</b>	<b>INTRODUCTION</b> .....	<b>51</b>
	<b>B.</b>	<b>CONTRACT TYPE TRENDS</b> .....	<b>51</b>
	<b>C.</b>	<b>DEPARTMENT OF DEFENSE</b> .....	<b>53</b>
		1. <b>Budget Category</b> .....	<b>53</b>

2.	Major U.S. Military Conflicts .....	54
D.	THE DEFENSE INDUSTRY.....	55
1.	Gross Domestic Product (GDP).....	55
2.	Defense Industry Periods .....	58
E.	DEFENSE MARKETPLACE TRENDS .....	61
1.	Workforce.....	61
VI.	CONCLUSION .....	65
A.	ANSWERS TO RESEARCH QUESTIONS .....	65
1.	Primary Research Question.....	65
2.	Our Secondary Research Questions Include the Following.....	66
B.	CONCLUSION .....	68
C.	FOLLOW-ON RESEARCH.....	70
APPENDIX A	.....	73
A.	ACQUISITION REFORM INITIATIVES .....	73
APPENDIX B	.....	77
A.	DEFINITIONS .....	77
LIST OF REFERENCES	.....	81
INITIAL DISTRIBUTION LIST	.....	87

## LIST OF FIGURES

Figure 1.	Cost Overruns by Contract Type. (From Berteau et al., 2011) .....	2
Figure 2.	Use of the Terms Contract <i>Type</i> and <i>Major Weapon System</i> in American Literature from 1947–2008. (From Michel et al., 2011) .....	7
Figure 3.	Use of the Term <i>Contract Type</i> in American Literature. (From Michel et al., 2011).....	8
Figure 4.	Use of the Terms Fixed-Price Contract, Cost-Plus Contract, and Cost-Reimbursement Contract in American Literature. (From Michel et al., 2011).....	9
Figure 5.	Use of the Term <i>Contract Type</i> Compared to <i>Fixed-Price Contract</i> in American Literature from 1947–2008. (From Michel et al., 2011) .....	9
Figure 6.	Use of the Term <i>Contract Type</i> Compared to Use of the Terms <i>Cost-Reimbursement Contract</i> and <i>Cost-Plus Contract</i> in American Literature from 1947–2008. (From Michel et al., 2011).....	10
Figure 7.	DoD TBA by Contract Type Period (Millions of Constant FY 2011 Dollars). (From National Defense Budget Estimates for FY 2012).....	52
Figure 8.	Relevant Budget Categories as a Percentage of DoD TBA. (From National Defense Budget Estimates for FY 2012).....	53
Figure 9.	DoD TBA & Major U.S. Military Conflicts (Billions of Constant FY 2011 Dollars). (From U.S. Office of Management and Budget, Historical Tables, Budget of the United States Government, Fiscal Year 2011, Table 3.1).....	54
Figure 10.	GDP percent Growth by Contract Type Period. (From U.S. Bureau of Economic Analysis.....	56
Figure 11.	GDP percent Growth using 5-yr MA. (From U.S. Bureau of Economic Analysis .....	56
Figure 12.	Receipts as a Percentage of GDP. (From Office of Management and Budget, Historical Tables .....	57
Figure 13.	Federal Receipts (Billions of Contant FY 2005 Dollars). (From Office of Management and Budget, Historical Tables .....	57
Figure 14.	GDP percent Change across Watts’ Defense Industry Periods. (From U.S. Bureau of Economic Analysis.....	58
Figure 15.	Variations in GDP Growth During Watts’ Defense Industry Periods. (From U.S. Bureau of Economic Analysis.....	59
Figure 16.	DoD TBA across Watts’ Defense Industry periods (Millions of Constant FY 2011 Dollars). (From (National Defense Budget Estimates for FY 2012).....	60
Figure 17.	Total Defense Marketplace Workforce. (From National Defense Budget Estimates for FY 2006) .....	61
Figure 18.	DoD Workforce percent Total Federal Workforce. (From National Defense Budget Estimates for FY 2012).....	62
Figure 19.	Combined Defense Marketplace Workforce. (From National Defense Budget Estimates for FY 2006).....	63

THIS PAGE INTENTIONALLY LEFT BLANK

## LIST OF TABLES

Table 1.	Comparison of Fixed-Price Contract Types. (From Leisenring, 2004) .....	11
Table 2.	Variations of Cost-Reimbursement Contract Types. (From Leisenring, 2004).....	12
Table 3.	Evaluation of the Commercial Marketplace vs. Defense Marketplace. (From Gansler et al., 2009, p. 7) .....	15
Table 4.	DoD Workforce Percent Total Federal Workforce. (Authors).....	62



THIS PAGE INTENTIONALLY LEFT BLANK

## LIST OF ACRONYMS AND ABBREVIATIONS

ACAT	Acquisition Category
AF	Air Force
BBP	Better Buying Power
BEA	Bureau of Economic Analysis
CAAC	Civilian Agency Acquisition Council
CAE	Component Acquisition Executive
CNA	Center for Naval Analysis
CAS	Cost-Accounting Standards
CDP	Contract Definition Phase
CICA	Competition in Contracting Act
CJCS	Chairman of the Joint Chiefs of Staff
COTS	Commercial Off-the-Shelf
CPAF	Cost-Plus Award Fee
CPFF	Cost-Plus Fixed Fee
CPIF	Cost-Plus Incentive-Fee
CR	Cost Reimbursement
CRS	Congressional Research Service
DAB	Defense Acquisition Board
DAPA	Defense Acquisition Performance Assessment
DARC	Defense Acquisition Regulation Council
DAU	Defense Acquisition University
DAWIA	Defense Acquisition Workforce Improvement Act
DoD	Department of Defense
DFARS	Defense Federal Acquisition Regulation Supplement
DRMS	Defense Resources Management Study
DSB	Defense Science Board
FAR	Federal Acquisition Regulation
FASA	Federal Acquisition Streamlining Act
FP	Fixed Price
FFP	Firm-Fixed Price

FPEPA	Fixed-Price with Economic Price Adjustment
FPIF	Fixed-Price Incentive (Firm Target)
FPR	Fixed-Price Redetermination
FY	Fiscal Year
GAO	General Accounting Office (before July 7, 2004); Government Accountability Office (after July 7, 2004)
GDP	Gross Domestic Product
IMPROVE	Implementing Management for Performance and Related Reforms to Obtain Value in Every
IOC	Initial Operating Capability
JSF	Joint Strike Fighter
MDA	Milestone Decision Authority
MDAP	Major Defense Acquisition Program
MDD	Material Development Decision
NDAA	National Defense Authorization Act
NME	National Military Establishment
NPR	National Performance Review
NPS	Naval Postgraduate School
OFPP	Office of Federal Procurement Policy
O&M	Operations and Maintenance
OMB	Office of Management and Budget
OSD	Office of the Secretary of Defense
OT&E	Operational Test and Evaluation
OUSD (AT&L)	Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics
PM	Program Manager
PPBS	Planning, Programming, and Budgeting System
R&D	Research and Development
RDT&E	Research, Development, Test, and Evaluation
SAP	Simplified Acquisition Procedure
SAT	Simple Acquisition Threshold
SECDEF	Secretary of Defense
TBA	Total Budget Authority

TINA	Truth in Negotiations Act
TPP	Total Package Procurement
TFX	Tactical Fighter Experimental
USAF	United States Air Force
USD	Under Secretary of Defense
USD (AT&L)	Under Secretary of Defense for Acquisition, Technology, and Logistics
USN	United States Navy
WSARA	Weapon Systems Acquisition Reform Act
WWII	World War II

THIS PAGE INTENTIONALLY LEFT BLANK

## **ACKNOWLEDGMENTS**

First, we would like to thank our families for their continuous support, patience, and understanding. In particular, thank you to CAPT Charles Quinn, USN (Ret.).

This project would not have been possible without the guidance of LCDR Bryan Lundgren, SC, USN. We would also like to thank our support advisor, Dr. Max V. Kidalov, JD, LL.M. Without his support, this project would not have been possible.

THIS PAGE INTENTIONALLY LEFT BLANK

# I. INTRODUCTION

## A. BACKGROUND

Preference for a certain type of government contract has varied since the Department of Defense (DoD) formed in 1947<sup>1</sup>. Policy makers have tended to favor either cost reimbursement (CR) type contracts or fixed-price (FP) type contracts for various reasons. This paper explores factors that have influenced historical preference for a certain contract type and seeks to identify trends that could provide useful insight to Defense Acquisition policy makers.

On March 4, 2009, as government contracting appeared to struggle with cost overruns, schedule delays and an overall lack of performance, President Obama issued a memorandum on government contracting intended to prevent inefficiencies and further wasteful spending. In his memorandum, the President pointed out the current federal contracting trend of excessively relying on “sole-source contracts and cost-reimbursement contracts creates a risk that taxpayer funds will be spent on contracts that are wasteful, inefficient, subject to misuse, or otherwise not well designed...”. The memo urged agencies to limit the use of CR contracting and promoted FP contracting (Sacilotto, 2011).

On July 29, 2009, as directed by the Presidential memorandum, the Office of Management and Budget (OMB) issued guidance to government agencies on reviewing existing contracts and procurement (OMB, 2009). To implement the guidance from the President and OMB, Dr. Ashton B. Carter, the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD [AT&L]) for the DoD established the Better Buying Power (BBP) policy, memorandum and guidance for achieving greater efficiency and productivity in defense spending on September 14, 2010. The BBP

---

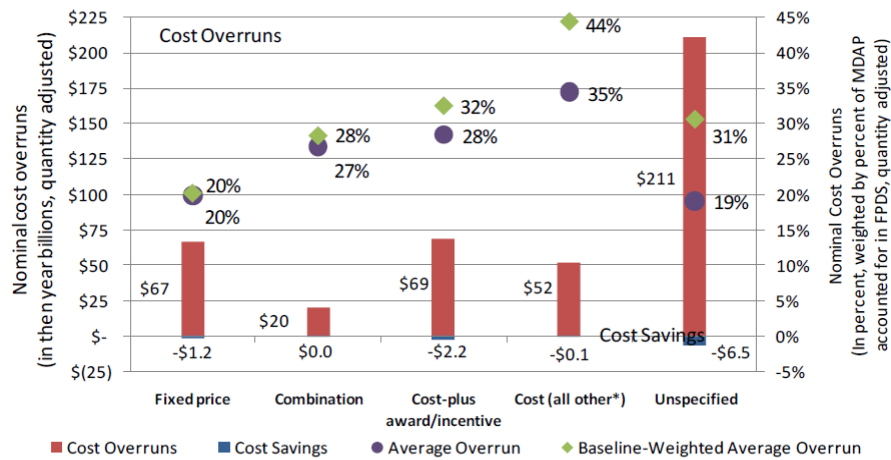
<sup>1</sup> The National Military Establishment was created in 1947, and it was renamed as the Department of Defense (DoD) by the amendment to the National Security Act of 1949.



policy emphasized the increased use of fixed-price incentive firm target (FPIF) contracts and contained specific guidance for delivering better value to the taxpayer and warfighter (USD [AT&L], 2010a; USD [AT&L], 2010b).

On March 16, 2011, the Defense Acquisition Regulation Council (DARC) and the Civilian Agency Acquisition Council (CAAC) issued an interim Federal Acquisition Regulation (FAR) rule that increased oversight and called for additional contract documentation requirement and justification on all services when using CR contracts (Sacilotto, 2011). Moreover, on October 12, 2011, Senator McCain introduced Senate Bill 1694, Defense Cost-Type Contracting Reform Act of 2011, to limit the use of cost-type contracts by the DoD for major acquisition programs.

In April 2011, the Center for Strategic Studies published *Cost and Time Overruns for Major Defense Acquisition Programs* and presented the findings that indicated FP contracts have on average less cost growth than cost-type contracts, as shown in Figure 1 (Berteau, Ben-Ari, Hofbauer, Sanders, Ellman, & Morrow, 2011).



\* Cost (all other) includes time and materials contracts as well as labor hours contracts.  
 Source: Selected Acquisition Reports; analysis by CSIS Defense-Industrial Initiatives Group

Figure 1. Cost Overruns by Contract Type. (From Berteau et al., 2011)

According to the Center for Strategic Studies, cost-plus contracts seem to be the driving factor for cost overruns. Both cost-plus award and incentive type contracts have

high average cost overrun percentage compared to the fixed price contract. This report also mentioned that FP contracts are more commonly used for mature technology and considered being low on risk (Bertheau et al., 2011).

Contract-type preference is a multivariate debate. The contract type itself may not be the root cause of a cost overruns, schedule delay and performance deficiency. Rather, the wrong choice of contract type for a particular procurement may be the root cause of the problem. Each contract type can appear better than the other when used properly. For example, a CR contract may best be appropriate for a R&D contract, while a FP contract may best be appropriate for a production contract. Extreme cost overruns can distort quantified data and thrust a program into public scrutiny. In this paper, we compare historical trends in the use of contract type to relevant financial, economic, industrial, and output measures.

## **B. OBJECTIVE OF THE RESEARCH**

In conducting this research, our objective was to document and quantify historical trends for preferences in contract type. On the surface, it appears that acquisition policy repeats itself. We identified trends based on the findings and recommendations of significant studies conducted on defense acquisition and the acquisition of major weapon systems; we began our review of these studies with the establishment of the DoD in 1947 to the present. By highlighting trends and making insightful observations, we hope this project will provide acquisition professionals who work with major weapon systems a greater perspective on the debate over the most appropriate contract type for use in major weapon systems.

## **C. RESEARCH QUESTIONS**

The following is our primary research question:

- Is the most recent preference, beginning in 2009, for FP contracting historically consistent with prior trends?

Our secondary research questions include the following:

- What are the historical indicators for the DoD's cyclical preference for certain types of contracts?
- Is the DoD's preference for FP contracts responsive to changes in total defense budget authority?
- Is the DoD's preference for FP contracts responsive to prevailing trends in acquisition reform literature?
- Is the DoD's preference for FP contracts responsive to growth or decline in the economy?
- Is the DoD's preference for FP contracts responsive to growth or decline in the defense industry, and what is the likely or potential impact of such preference on the defense industry?

#### **D. METHODOLOGY**

Research was conducted for this project through literary searches into the history of defense acquisition, focusing on major weapon systems. We collected research data from various sources, including Government Accountability Office (GAO) reports, Congressional Research Service (CRS) reports, DoD directives and publications, and other scholarly writings.

#### **E. SCOPE AND LIMITATIONS**

The scope of this project comprises the following research activities, which are described by chapter:

1. Chapter I defines the issue of contract type related to defense acquisition, identifies research questions, and develops methodologies that frame our research efforts.
2. Chapter II conducts a literature review of select acquisition reform initiatives and major studies from 1947 to the present.
3. Chapter III reviews the unique aspects of the defense weapons marketplace.
4. Chapter IV reviews historical defense acquisition policies, studies, and case histories.

5. Chapter V analyzes the trends, issues, contributing factors, and effectiveness of historical acquisition reform.
6. Chapter VI answers the research questions, proposes relevant recommendations, and discusses possible areas for future research.

We recognize the following limitations to our study:

1. Major weapon systems contracts typically utilize more than one contract type. In this project, we focus on the predominant contract type used based on historical precedent.
2. Research of major weapon systems acquisition reform has been extensively documented by many other researchers and authors, as reflected in Appendix A. In this project, we use only the literature that has most significantly influenced or shaped the acquisition process.
3. In this project, we do not include surveys or interviews to examine the perceptions of current defense decision makers in government and industry, acquisition professionals, or other subject-matter experts in the acquisition field.

THIS PAGE INTENTIONALLY LEFT BLANK

## II. LITERATURE REVIEW

### A. INTRODUCTION

The amount of literature addressing the topics of contract type and major weapon systems is immense. Across the history of DoD, there always seems to be a prominent Defense Acquisition case (Chapter IV examines significant cases). Figure 2 is a chart from Google Books Ngram Viewer that shows how the use of the terms *contract type* and *major weapon system* has changed over time. Figure 2 shows the percentage each term was used in published American literature from 1947–2008. The use of the term *major weapon system* appears to be correlated to the use of *contract type* until around the mid to late 1990s.

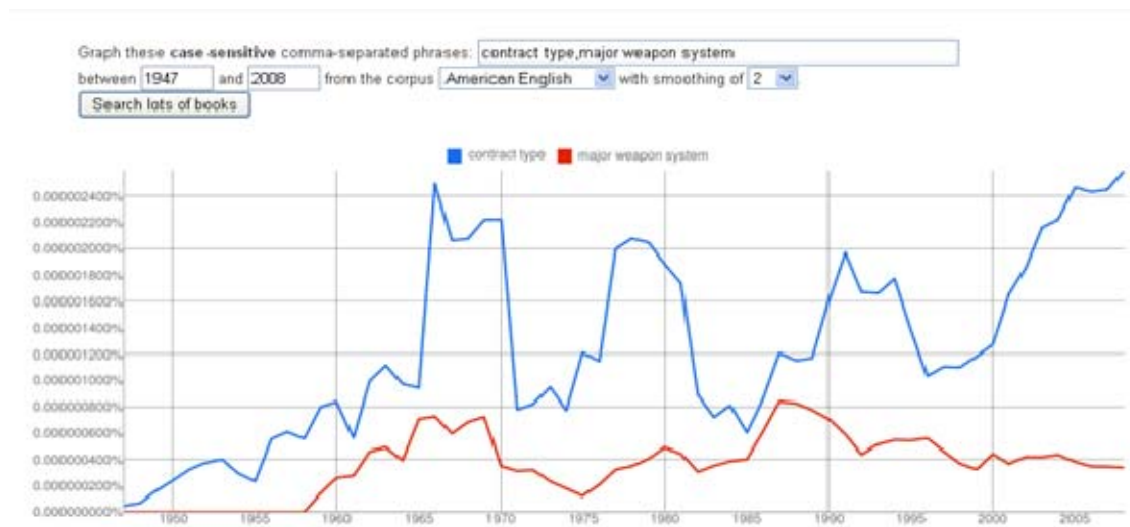


Figure 2. Use of the Terms *Contract Type* and *Major Weapon System* in American Literature from 1947–2008. (From Michel et al., 2011)

The Google Ngram Viewer tool normalizes the data so that the number of books used in the calculation does not skew the results. The chart in Figure 2 only reflects data published in English and in the United States. The term *smoothing* refers to the number of years grouped as a moving average. A smoothing of 0 reflects raw data. A smoothing of 2 for the year 2000 would include the years 1998, 1999, 2000, 2001, and 2002.

Figure 3, with a smoothing of 0, shows precisely when the use of the term *contract type* peaked in American literature.

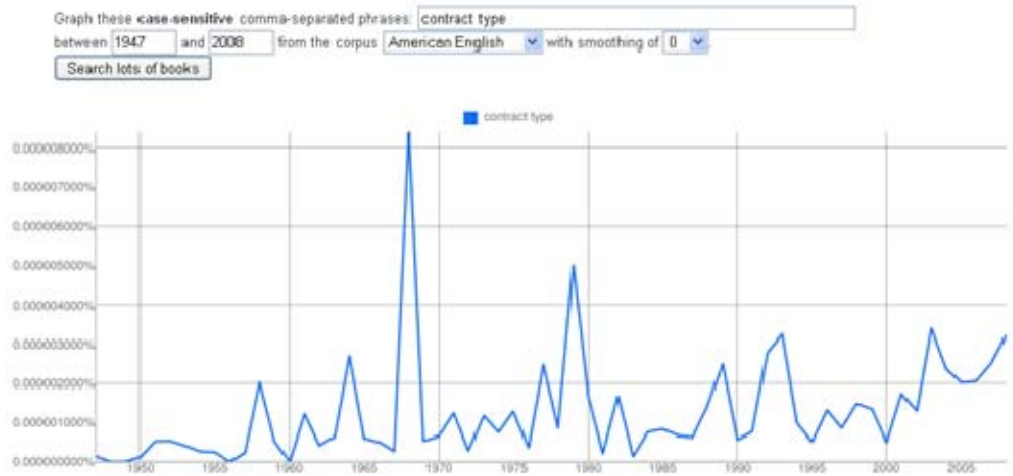


Figure 3. Use of the Term *Contract Type* in American Literature. (From Michel et al., 2011)

Figure 4 shows how often the terms *fixed-price contract*, *cost-plus contract*, and *cost-reimbursement contract* appear in American literature. Clearly, the mid-1960s to early 1970s was a noteworthy period. Not only did use of the term *fixed-price contract* surge, but also use of the term *cost-reimbursement contract* was more frequent than use of the term *cost-plus contract*.



Figure 4. Use of the Terms Fixed-Price Contract, Cost-Plus Contract, and Cost-Reimbursement Contract in American Literature. (From Michel et al., 2011)

Figures 5 and 6 also show that use of the term *fixed-price contract* appears to have a higher correlation to the use of the term *contract type* than to the use of the term *cost-plus contract* or *cost-reimbursement contract*.



Figure 5. Use of the Term *Contract Type* Compared to *Fixed-Price Contract* in American Literature from 1947–2008. (From Michel et al., 2011)



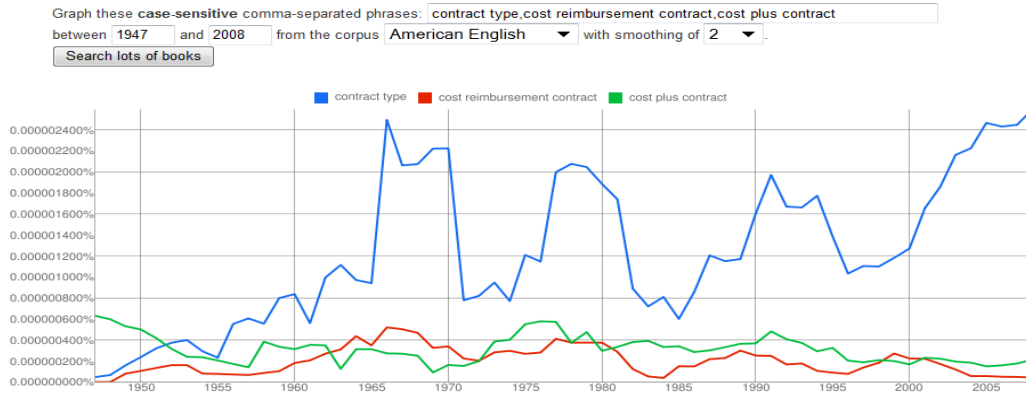


Figure 6. Use of the Term *Contract Type* Compared to Use of the Terms *Cost-Reimbursement Contract* and *Cost-Plus Contract* in American Literature from 1947–2008. (From Michel et al., 2011)

In addition to identifying cultural trends by using published literature in Google Ngram, we identified significant initiatives that have contributed to how the DoD acquires major weapon systems. Lists of significant acquisition reform initiatives have previously been compiled by industry experts. The list we compiled in Appendix A of this paper includes some of the same initiatives as those listed by industry experts; however, we have included additional acquisition reform studies on our list.

## B. TYPES OF CONTRACTS

There are two major categories of contract types that are generally used, FP contracts and CR contracts. FP contracts tend to be more risky to the contractors as far as the cost and performance are concern. CR contracts tend to be more risky to the government as cost and performance are often not defined or matured.

### 1. Fixed-Price (FP) Contracts

For FP contract types, the contractor is obligated to deliver the products and services at the price agreed upon with the government. The total price should not exceed the amount stipulated in the contract (Leisenring, 2004). Darst and Roberts (2010) state that FFP contracts carry more risk for the contractor than for the government and that great cost control and efficiency are the key factors to achieving the maximum profit

(Darst & Roberts, 2010). FFP contracts required less administrative work for contractor and limit government’s oversight during the performance (Darst & Roberts, 2010, p. 20).

Table 1 differentiates variations of FP contracts.

Table 1. Comparison of Fixed-Price Contract Types. (From Leisenring, 2004)

	<b>FFP</b>	<b>FPEPA</b>	<b>FPIF</b>	<b>FPAF</b>	<b>FPRP</b>
Used when	Requirement is well defined; contractor is experienced; stable market; insignificant financial risks	Significant risk to market prices due to industry-wide factors beyond the contractor's control; Dollars at risk outweigh administrative burden	Ceiling price can be established that covers the risks inherent in the work effort; profit sharing formula motivates contractor to control costs	Acceptance criteria can be fairly evaluated; fee will provide meaningful incentives and justify related administration burden	DOD requires firm commitment for materiel or services during subsequent years; dollars at risk outweigh administrative burden
Principal Risk to DOD	None. Contractor assumes all cost risk	Unstable market prices for labor or materiel over period of contract	Moderately uncertain contract labor or materiel requirement	Contractor may not meet acceptance criteria	Costs of performance after first year cannot be accurately estimated
Required contract elements	Firm fixed-price for all contract deliverables	Fixed-price; ceiling for upward adjustment; formula for price adjustment for market conditions	Ceiling price; target cost; target profit; delivery and quality targets; profit sharing formula	Firm fixed-price; performance evaluation standards; procedures for calculating fee based on performance standards	Fixed-price for first period; Proposed subsequent periods; Timetable for pricing next periods
Typical Uses	Commercial materiel and services	Commercial materiel and services during periods of market instability	Production of a major system based on a prototype	performance-based contracts for materiel and services	Long-term production of spare parts
Contractor obligation	Provide acceptable deliverable at specified time, place and price	Provide acceptable deliverable at specified time, place and adjusted price	Provide acceptable deliverable at specified time, place and at or below ceiling price	Perform at the time, place and price fixed in the contract	Provide acceptable deliverable at specified time, place and at price established for each period
Contractor incentive	Additional profit for reduction in performance costs	Additional profit for reduction in performance costs	Higher profit for completing work below ceiling price and/or meeting objective performance targets	Additional profit for reduction in performance costs; additional fee for meeting performance standards	Additional profit for reduction in performance costs for performance periods
FAR limitations	Generally not appropriate for research & development	Must be justified	Must be justified; must be negotiated; adequate accounting system; cost data must support targets	Must be negotiated	Must be negotiated; adequate accounting system; prompt redeterminations
Variants	<b>FPLOE</b>		<b>FPIS</b>		<b>FPRR</b>

## 2. Cost-Reimbursement (CR) Contracts

Under a CR contract the contractor obligates to deliver their best effort to provide the products and services outlined in the contract (Leisenring, 2004). CR contracts place less risk on the contractor since all allowable costs get paid by the government and fees are embedded within the contract to further incentivize the contractor when cost savings are observed. CR contracts should be used to acquire requirements that are not fully defined or where technologies are not fully developed or matured. Table 2 differentiates variations of CR contracts.

Table 2. Variations of Cost-Reimbursement Contract Types.  
(From Leisenring, 2004)

	<b>CPIF</b>	<b>CPAF</b>	<b>CPFF</b>	<b>CR or CS</b>	<b>LH or T&amp;M</b>
Used when	Objective relationship can be established between the fee and measures of contract performance	Objective relationship between fee and measures of performance are not feasible. Subjective standards can be fairly applied	Relating fee to measures of contract performance is unworkable or of marginal utility	Contractor expects substantial compensating benefits for absorbing part of the cost and/or foregoing fee; non-profit contractor	No other type of contract is suitable due to contract delivery requirements or other factors
Principal Risk to DOD	DOD assumes the majority of the risk inherent in the contract due to highly uncertain and speculative labor, material and other requirements necessary to perform the contract.				
Required contract elements	Target cost; minimum, maximum and target fee; formula for adjusting fee based on actual costs and/or performance	Target cost; Standards for evaluating performance; Base and maximum fee; procedures for adjusting fee based on performance against standards	Target cost; fixed fee	Target cost; If CS, an agreement on the DOD share of the cost; no fee	Ceiling price per hour labor rate that includes overhead and profit; provisions for reimbursing direct material costs
Typical Uses	Research and development of the prototype for a major system	Large scale research study	Research study	Joint research with non-profit institutions	Emergency procurement of repairs
Contractor obligation	Make a good faith effort to meet the contract requirements within the estimated cost and schedule				make a good faith effort to meet the contract requirements within the ceiling price
Contractor incentive	Realize a higher fee by completing work at a lower cost and/or by meeting other objective performance target	Realize a higher fee by meeting subjective performance standards	Realize a higher rate of return (fee divided by total cost) as total cost decreases	if CS, shares in providing a deliverable of mutual benefit	None
FAR limitations	Must be justified; must be negotiated; contractor must have an adequate accounting system; DOD must exercise surveillance during performance to ensure efficient methods and cost controls; Statutory and regulatory limits on fee; must include cost limits				Labor rates must be negotiated; must be justified; DOD must exercise surveillance to ensure efficient performance
Variants			Completion on term		FPRR

### C. WHAT IS A WEAPON SYSTEM?

Fox (1988) defined weapon system in his book, *The Defense Management Challenge: Weapons Acquisition*, as follows:

Weapon system is often used interchangeably with major weapon systems or major programs. “The term *weapon systems*—or often *major weapon systems or major programs*—refer to technically complex items such as aircrafts, missiles, ships, and tanks. A weapon system includes not only the major item of equipment itself but also the subsystems, logistical support, software, construction, and training needed to operate and support it.” (p. 9)

#### **D. DEPARTMENT OF DEFENSE ACQUISITION**

In his paper, A Study on Improving Defense Acquisition Through the Application of Defense Acquisition Workforce Improvement Act (DAWIA) Concept to Defense Industry Workforce, Choi (2009) briefly stated the history of defense acquisition as follows:

The Department of Defense (DoD) has a long and inconsistent history of defense acquisition program successes and failures. When the programs and projects fail, causing cost overruns, schedule delays and performance shortfalls both the warfighters and taxpayers are at loss. The repeated and growing failures in defense acquisition over the past decades, have been well documented and reported in numerous Government Accountability Office (GAO), Office of the Secretary of Defense (OSD), and various other agency reports, along with Congressional panels and commissions. The recurring and cited causes are: unclearly stated, inaccessible, and changing needs and requirements; unstable year to year funding; congressional and bureaucratic meddling; poorly established and tracked baseline; and insufficient investment in systems engineering and program management. Numerous studies and examinations have also produced similar observations regarding systemic shortfalls and recommended fixes. While the DoD's acquisition policies and directives adopted many of the most substantive findings and recommendations of these reviews, the people managing the process lacked the will to carry through and implement them in program decisions; (p. 1)

#### **E. SUMMARY**

There is an immense amount of research in literature on acquisition reform and the acquisition of major weapon systems. This chapter identifies historical trends in American literature, using the Google Ngram tool, of key acquisition terms. Additionally, more details on Defense Acquisition initiatives that have influenced how the DoD acquires major weapon systems will be discussed in a later chapter of this paper.

THIS PAGE INTENTIONALLY LEFT BLANK

### III. THE DEFENSE MARKETPLACE

#### A. DEFENSE INDUSTRY OVERVIEW

The market of the defense industry in the United States is different than the commercial marketplace in a number of respects. Lorell, Lowell, Kennedy, and Levoux (2000) defined the uniqueness of the U.S. defense market in two ways. First, the U.S. defense market for weapon systems is characterized by a single buyer (Lorell et al., 2000, p. 13). “The second distinguishing feature of the weapons market is that it is characterized by a higher degree of technical complexity and innovation than most commercial product markets” (Lorell et al., 2000, p. 14). These two distinct characteristics make the defense marketplace inherently more risky than the commercial marketplace (Lorell et al., 2000, p. 14).

Gansler, Lucyshyn and Arendt (2009) compared other distinctive factors of the defense market and commercial market in Table 3.

Table 3. Evaluation of the Commercial Marketplace vs. Defense Marketplace.  
(From Gansler et al., 2009, p. 7)

Aspect	Commercial	Defense
Products	Proven Technology, rapidly applied	Cutting-edge Technology, slowly applied
Market Structure	Many buyers and multiple producers	One buyer, large items bought in small quantities
Demand	Competitive, sensitive to price and quality	Monopsonistic, rarely price-sensitive, driven by maximum performance
Supply	Competitive, adjusts to demand	Oligopolistic, large excess capacity
Entry and Exit	Movement in and out of market	Extensive barriers to entry and exit (e.g., unique DoD “requirements,” perception of higher cost of two suppliers, Congress)
Prices	Constrained by market competition	Cost-based and regulated
Outputs	Constrained by market competition	Determined by government
Risk	Borne by firm	Shared between firm and government
Profits	Constrained by market competition	Regulated by the government
Competition	In production	Generally only for R&D

## **B. DEVELOPMENT OF THE U.S. DEFENSE INDUSTRY**

In his paper, *The U.S. Industrial Base: Past, Present and Future*, Barry D. Watts (2008) divided the defense industry into three periods: (1) the “Growth” Period, (2) the “Mature” Period, and (3) the “Restructuring” Period. His time series analysis of the defense industry forms the foundation of analysis found later in Chapter V. Watts (2008) explained these periods in the following way:

These periods roughly parallel the emergence of the Cold War, its prosecution, and the industry’s efforts to deal with the security environment that emerged after the Cold War ended. The boundaries between these periods are not precise, and within each period there were developments that affected the U.S. industrial base, including military conflicts, fluctuations in defense spending, the introduction of new technologies, and emergence of new types of systems. Nevertheless, each period has distinct characteristics in terms of customer interest and actions, overall government buying practices, and the size and structure of the industrial base. (p. 9)

### **1. Watts’ Growth Period: 1948–1960**

In describing the conditions of what he labeled the Growth Period, Watts (2008) writes the following:

The years 1948 to 1960 saw the establishment of America’s first large-scale peacetime military force. Investments in research and development (R&D) and procurement to outfit that force occurred along with corresponding increases in annual funding for national defense. These developments led to the emergence of a large set of private-sector companies supporting the U.S. military.

...As with any emerging industrial sector, the early years were dynamic ones of change and expansion, including the entry and exit of many companies. Barriers to entry were “relatively low compared to much of manufacturing,” because of the “high rate of technological change.”<sup>23</sup>...

By the end of the 1950s many enduring characteristics of the defense industry were beginning to take forms that were to govern it for the next forty to fifty years. The barriers to entry and exit from the defense industry were rising. As one study noted, “It is especially significant that once firms entered the weapons industry, the process is not easily reversed.”<sup>41</sup> Increasingly, the uniqueness of the products and services of the industry and the buying habits of the government were to separate the defense industry from others in the American economy.<sup>42</sup> (pp. 13, 14, 18)

## **2. Watts' Mature Period: 1961–1990**

In describing the characteristics of what he labeled the Mature Period, Watts (2008) writes:

From 1961 to 1990, the U.S. defense establishment focused on the Soviet Union as the major challenge to American security and the principal indicator of the adequacy of the U.S. military. The various classes of major systems that had begun gaining prominence from 1945 to 1960 continued to be central components of U.S. military forces through 1990.

The U.S. military also began giving greater emphasis to operational art and joint operations and developed new approaches to combat such as “AirLand Battle” and precision strike. A related trend that influenced many system development efforts was greater attention to improving connectivity, standardization, interoperability, reliability, and maintainability. (pp. 18–19).

## **3. Watt's Restructuring Period: 1991–2007**

In describing the characteristics of what he labeled the Restructuring Period, Watts writes:

The collapse of the Soviet Union fundamentally changed the international security environment in which the U.S. defense industry had operated for more than thirty years. The United States no longer faced a “near-peer” superpower rival whose nuclear forces posed an existential threat to America, and what remained of the Cold War’s bi-partisan consensus on national security rapidly disappeared...

The rise of challenges quite different from those that dominated U.S. national security during the Cold War, together with the desire for defense transformation and expensive combat experience in Afghanistan and Iraq, have altered the mix of systems and services demanded by the American military. In the absence of a major new strategic direction, certain products retained their importance, although their size, composition and growth rates often changed. The emergence of new warfighting concepts (Network Centric Warfare, Effects Based Operations, Cyber war, etc.) and battlefield experience increased the military’s emphasis on integrating capabilities across the diverse systems, warfighting communities, and the military Services themselves. (pp. 26–27)



#### **4. The U.S. Defense Industry Today**

In describing the characteristics of the U.S. defense industry today, Watts (2008)

writes:

Structural changes in the defense industry from the mid-1980s to the present, together with the US government's actions affecting the industry, reduced the number of firms capable of competing in any one defense product or service area; further, the size and scope of surviving firms changed along with the relationships between these firms and the US government.<sup>96</sup> The general result has been to restrict the Defense Department's choice of suppliers for major programs to, at most, two or three of the prime contractors....

The overall result is that the government now deals with companies that have a mix of vertical and horizontal capacities and of cross-company ties. Companies may be able to build ships, submarines, armored and light combat vehicles, but also be able to build major subsystems for their platforms. Depending on the program, companies may see the need to pick another firm as a supplier because of ties to that firm in other businesses, and not because that firm provides the best subsystem or component. Consequently, the government has to broaden its scope in awarding contracts if it wants to shape the future structure of the industry. (pp. 36, 41)

## IV. CONTRACT TYPE TRENDS

### A 1947–1964: CR PERIOD, THE POST WORLD WAR II PERIOD

#### 1. Background

##### *a. Defense Environment*

Lessons learned from WWII significantly transformed the U.S. military. In an effort to consolidate defense, the National Security Act of 1947 created the National Military Establishment (NME), which combined both the Department of War and the Department of the Navy. Two years later the NME was renamed to the Department of Defense (DoD) by the National Security Act of 1949. The National Security Act of 1949 unified all services under one control.

Following WWII, the U.S. defense industry developed many new weapon systems, which attributed to an increased spending in research and development (R&D) (Sacilotto, 2011, p. 686). From 1947 to 1964, R&D spending grew by 371 percent as a percentage of DoD total budget authority (TBA), or gross defense spending (National Defense Budget Estimate, 2011). A major area of focus was on the development of major missile programs. (Sacilotto, 2011, p. 686) The defense budget was authorized to develop nearly any weapon system that would give the United States the power to surpass its challengers (Fox, 2011, p. 9). During the Korean War, between 1950–1952, DoD TBA averaged \$521B, which was 44 percent higher on average than the other 15 years of this period (National Defense Budget Estimates, 2011).

U.S. troops arrived in South Vietnam in 1961 following the signing of a military and economic aid treaty between the U.S. and Vietnam (Tulalip Tribes, 2003). However, the defense budget would not expand until 1965 when 200,000 troops were deployed there (Vietnam War, 2007).

##### *b. Industry Environment*

The need to produce war supplies had given rise to a huge military-industrial complex (a term coined by Dwight D. Eisenhower, who served as the U.S.

president from 1953 through 1961) (Conte & Karr, 2001). Between 1947–1964, U.S. gross domestic product (GDP), a measure of countries productivity, expanded by 272 percent (BEA, 2011). Conte and Karr (2001) describe the U.S. industrial environment of the time:

Many Americans feared that the end of World War II and the subsequent drop in military spending might bring back the hard times of the Great Depression. But instead, pent-up consumer demand fueled exceptionally strong economic growth in the post war period. The automobile industry successfully converted back to producing cars, and new industries such as aviation and electronics grew by leaps and bounds. A housing boom, stimulated in part by easily affordable mortgages for returning members of the military, added to the expansion... At the same time, the jump in postwar births, known as the "baby boom," increased the number of consumers. (p. 17)

## **2. Cost Reimbursement**

After WWII, cost plus contracts were widely used for development programs. Most of the initial development contracts, however, were sole source and tend to caused significant cost growth (Sacilotto, 2011, p. 686). The DoD was looking for the most technologically advanced weapon systems. As a result, the majority of the defense contracts were awarded as sole source or with more than 40 percent being CPFF contracts. (Fox, 2011, p. 9) In his article *Defense Acquisition Reform, 1960–2009: An Elusive Goal*, Fox (2011) cites David Acker, in his article, *The Maturing of the DoD Acquisition Process: Defense systems Management Review*, to characterize the Defense Acquisition environment of the 1950s:

Such considerations as “should cost,” “design-to-cost,” and “life-cycle cost” were not uppermost in the minds of defense planners until the late 1950s. Both development and production were carried out under cost-reimbursement contracts. In this environment, production costs did not pose a major constraint on engineering design. When a design was discovered to be impractical in production—or to be inoperative in field use—it was modified in accordance with government funded engineering changes. . . .

The lack of a well-organized and integrated DoD financial management system, along with the practice of “piecemeal” procurement, led to unstable employment in the defense industry and the emergence of a

transient work force. Many of the contractors being challenged to develop and produce defense systems on the outer fringes of technology found it difficult to create and maintain smoothly functioning program management teams. (p. 9)

In 1961, Robert McNamara became SECDEF and immediately strove to end cost-based contracts (Bright, 1978). The subsequent shift to FP contracting, though, did not become engrained within DoD until 1965 in the new form of contracting called Total Package Procurement (TPP).

### **3. Significant Case: General Dynamic's F-111 Aardvark**

The DoD's pursuit of the most effective weaponry often experienced technical problems, cost overruns, and delays in production. Such was the case for General Dynamic's F-111 Aardvark. The F-111 program consisted of two definitized contracts for R&D and for the production contract, both of which were FPIF type (TFX F-111A/ Source Selection, 1963).

The F-111 contract represented a decided shift away from CR contracting. In his book, *The Jet Makers*, Dr. Charles Bright describes the three stages of SECDEF McNamara's procurement ideas, "The F-111 contract competition was chosen by McNamara for his second step: to assert civilian dominance over procurement. Before the F-111, the USAF's multilayered selection and review arrangement, capped by the Air Council, had controlled procurement" (Bright, 1978).

The F-111 was designed to meet both Air Force and Navy requirements for a jet fighter. The Air Force required a supersonic tactical fighter bomber, and the Navy needed a carrier-based fleet defense interceptor. The F-111's multi-purpose and difficult to achieve requirements made the F-111 development extremely expensive, risky and hard to manage (Richey, n.d.). During the planning phase of F-111, the planner gave priority to Air Force requirements and tried to tailor Navy's requirements which led the Navy to give up the project because F-111 failed to meet the specification that Navy needed (Richey, n.d.).

Due to its complex development requirements and functionality, the production cost for F-111 reached \$6.3 million, which exceeded the estimated cost of \$4.5 million per aircraft. Consequently, DoD produced 50 percent fewer aircraft than had originally been planned.

In spite of all its technical problems and cost overrun, ironically, the F-111 Aardvark's performance record is considered one of the safest in USAF history for an all-weather interdiction aircraft (Richey, n.d.).

#### **4. Acquisition Reform Initiatives**

##### ***a. First Hoover Commission, 1949***

The same year DoD formed, in 1947, President Harry S. Truman authorized the first Hoover Commission, which sought to reorganize the Executive Branch. The commission forwarded its 273 recommendations to Congress in a series of nineteen separate reports in 1949. Most notably, the commission addressed the role of the SECDEF and questions about what the overarching structure of the American military should be (Gholz, McKinney, & Sapolsky 1994). The commission was officially terminated on June 12, 1949.

##### ***b. Second Hoover Commission, 1955***

The Second Hoover Commission sought further improvements upon the Executive Branch. Mostly notably, the commercial industry was used as a model to shape governmental operations.

In their paper, *Acquisition Reform-Lean 94-03*, Gholz, McKinney, and Sapolsky (1994) described the Second Hoover Commission as follows:

The Second Hoover Commission Commission...examined the defense procurement process in greater depth, although it was primarily concerned with achieving efficiencies in the purchase of commodity goods, such as soap or mops, rather than reviewing how advanced weapon systems were produced. The second Hoover Commission is notable for conceiving the administration of the DoD as if it were a large corporation rather than a

military organization. This mode of thinking—adopting commercial practices for the government—has been a nearly pervasive feature of subsequent acquisition reform plans (n.p.).

*c. The Weapons Acquisition Process Study by the Harvard Business School, 1962 and 1964*

In 1962 and 1964, two innovative books on the development of advanced weapons were released: *The Weapons Acquisition Process: An Economic Analysis*, by Merton J. Peck and Frederic M. Scherer, and *The Weapons Acquisition Process: An Economic Incentive*, by Frederic M. Scherer (Fox, 2011, p. 35). The first book, *The Weapons Acquisition Process: An Economic Analysis*, described the basic structure of the acquisition process and presented a comprehensive economic analysis (Fox, 2011, p. 35). Groundbreaking research defined the market system that made the weapons acquisition process so unique.

In his article, *Priced-Based Acquisition: Where in Federal Contracting?* Edwards (1999) quotes Peck and Scherer:

It is not only that a market system does not now exist in the weapons acquisition process. We can state the proposition more strongly. A market system in its entirety can never exist for the acquisition of weapons. (n.p.)

Four reasons to support Peck and Scherer’s conclusion (Edwards, 1999).

- Weapons development requires such large expenditures that contractors are unable to obtain private financing. The government has to finance weapons development.
- The financing problem is exacerbated by the many unique uncertainties associated with weapons development, both technical and political, which repel stockholders and other investors.
- Centralized planning is essential to determining weapon system performance and design requirements, but centralized planning is inconsistent with a market system.
- The government is the only buyer of weapon systems, so the many buyers, many sellers dynamic of a market system is not present to set prices.” (n.p.)

The second book, *The Weapons Acquisition Process: An Economic Incentive*, focuses on economic incentives inherent in Defense Acquisition. J. Ronald Fox (2011) states that Scherer examined the following six specific problems in the weapon acquisition process:

- Schedule slippage,
- Cost growth,
- Lack of qualified government personnel,
- High frequency of personnel turnover,
- Inadequate methods of cost estimation, and
- Insufficient training in the measurement and control of contractor performance. (p. 35)

*d. The Truth in Negotiations Act (TINA), Public Law 87 653, 1962*

TINA allows contracting officers to better determine price reasonableness on all proposals over \$700,000. The Act requires contractors to provide certified cost or pricing data. The cost or pricing data should be accurate, current and complete. Data should be factual, not judgmental and verifiable, such as vendor quotations, nonrecurring costs, information on purchasing volume, and related operations costs, etc. Exceptions to TINA are when there is adequate price competition (two or more offers), price set by law or regulation, acquisition of a commercial item, or where a waiver has been granted.

**B 1965–1969: FP PERIOD, THE TOTAL PACKAGE PROCUREMENT PERIOD**

**1. Background**

*a. Defense Environment*

On March 8, 1965, 3,500 United States Marines were dispatched to South Vietnam; the number of troops was increased to nearly 200,000 by December of the same year. The war was not going well because the military planners were not equipped to deal

with guerilla tactics (Vietnam War, 2007). Military losses were increasing, and Americans began to question why the U.S. was in this war in the first place (Vietnam War, 2007).

In March 1968, SECDEF McNamara left the Pentagon after serving more than seven years in the position. After McNamara's departure, cost, schedule, and performance issues combined with the failure of the Total Package Procurement (TPP) concept, prompted President Richard M. Nixon to appoint the Blue Ribbon Defense Panel, or Fitzhugh Commission, in 1970 (Fox, 2011, p. 40). The Panel would examine the weapons development process in great detail.

### ***b. Industry Environment***

The defense industry expanded in response to increased demands of the Vietnam War. Between 1965–1970, the defense budget grew by 22 percent from the proceeding five- year period (National Defense Budget Estimate, 2011). In his book *The Defense Industry*, Jacques S. Gansler (1982) described the U.S. defense industry as “going through major changes in the mid-1960s that paralleled the increase in purchasing for the Vietnam War and the subsequent decline in spending as U.S. participation ended.” He continues stating:

Conglomerates became interested in buying into the industry in the 1960s because of its large R&D levels, long production runs and counter-cyclical characteristics. In the mid-1960s firms incurred substantial levels of debt to expand “plant and tooling” to respond to the demands stemming from the war. (p. 138)

## **2. Fixed Price**

In 1965, the Total Package Procurement (TPP) concept emerged as a form of FP contracting. The concept of TPP is to combine the design, development and production as a package and using FP contract. The goal of this concept was to prevent the contractor from proposing an unrealistic low bid to get the contract and compensating themselves during the production phase, which was the major cause for cost overrun. Additional anticipated benefits of TPP were contractor's commitment to cost, efficiency in performance and production, and ample competition (Sacilotto, 2011, pp. 688–689). All



these benefits were supposedly to promote efficiency in all aspect of program. However, the intended benefits and goals of TPP were not achieved, instead both government and contractor suffered from unintended disputes, cost growth and losses. Due to the unsuccessful outcome of C-5A trial and unpleasant experiences with TPP, this concept was eventually abandoned (Sacilotto, 2011, p. 683).

### **3. Significant Cases: Lockheed C-5A Galaxy**

The USAF C-5A Galaxy was the first program to use TPP. The C-5A was intended to transport over-sized and heavy cargos that other aircraft could not. As the first major weapon system that used TPP, the C-5A contract, a firm-priced incentive fee, included a provision to mitigate the risk between the Lockheed and government. Lockheed was responsible for the overall system development and General Electric was responsible for the aircraft engines. From the beginning, Lockheed experienced both a schedule delay and a performance shortfall due to an aircraft weight increase that exceeded system design limitations. This design flaw led to an extensive redesign effort. Ultimately, the C-5A program suffered major cost growth and reached the point that Lockheed could not continue the performance due to the financial issues. The C-5A contract was converted to a CR contract and the use of TPP was henceforth. The failure of TPP led to the acquisition policy favoring the use of CR contract for development efforts (Sacilotto, 2011, pp. 689–691). In her article, “*Déjà vu All over Again: Cost-Reimbursement Contracts Fall out of Favor Again, But Should They?*” Kara Sacilotto (2011) quoted GAO:

The Lockheed contract was an FPIF contract with a target cost of approximately \$1.7 billion, a target price of approximately \$1.945 billion, and a ceiling price of approximately \$2.3 billion...

In 1967, approximately two years after award, the USAF issued Lockheed a cure notice regarding the deficiencies in the aircraft and threatened to terminate the contracts for default...

...Regarding the use of the TPPC, the GAO stated: It should be recognized that the C-5A program was the first major weapon system procurement on which the total package concept was used. Our

preliminary conclusion indicates that this method may be best suited for the procurement of those systems requiring only limited additional development effort....

It seems clear that the Government prior to contracting for significant production units under a fixed pricing arrangement should have real assurance that the item can be produced and the costs can be predicted with reasonable accuracy. (pp. 689–691)

#### **4. Acquisition Reform Initiatives**

There was no significant Acquisition reform initiative published during this period. Following SECDEF McNamara's departure in 1968, and the seismic shift away from FP (TPP) contracting, President Nixon appointed the Blue Ribbon Defense Panel, or Fitzhugh Commission, in 1970.

### **C. 1970–1980: CR PERIOD, THE POST MCNAMARA PERIOD**

#### **1. Background**

##### *a. Defense Environment*

Throughout the Cold War, the DoD procured weapon systems to sufficiently deter the Soviet Union and its allies. This imposing threat dictated the spending in weapon system acquisition. Performance was the primary concern when developing new weapon systems followed closely by schedule concerns. As a result, the requirement drove performance, schedule and cost (Tyson, 1998, p. I–4).

In 1975, the last American troops departed Vietnam concluding the U.S. presence there (The History Place, 1999). Deaths of American troops totaled 58,193 (National Archives, 2007).

Between 1970 and 1980, DoD TBA averaged \$402 billion, 22 percent less than that of the preceding Total Package Procurement Period (National Defense Budget Estimates, 2011). When budgets were not enough to procure required systems, often times the quantity was reduced to fit the budget, not the performance (Tyson, 1998, p. I–4).

***b. Industry Environment***

During the Post McNamara Period, DoD placed increasing demands on the defense industry. The defense industry was forced to concentrate on unique weapon systems provided by DoD (Tyson, 1998, p. I-4). While major weapon systems became increasingly complex, DoD TBA declined. National Security objectives did not appear to align with the reality of a reduced defense budget. New technologies demanded by the DoD required predominately CR contracts due to unknown development and production cycles. The unattractive high level of risk with developing new technologies and a lower DoD TBA discouraged participation in the defense industry. As government continued to impose high regulations and cumbersome processes to the commercial industry in development of weapon systems, some companies were reluctant to do business with DoD (Tyson, 1998, p. I-5).

Watts (2008) in his paper, *The U.S. Defense Industrial Base: Past, Present and Future*, describes the U.S. defense industry in 1970s:

Since the 1970s, American defense firms have increasingly adopted management practices from the commercial sector. These practices have resulted in the strategic goals of many defense firms more closely resembling those of commercial firms. Top managers of many defense firms have found themselves concentrating more and more on bottom-line financial returns for their shareholders, increasing their share of the market, and eliminating competition...(pp. 2-3)

When purchases fell rapidly after the war and interest rates climbed in the 1970s, many firms encountered significant cash flow problems. Several required assistance from the government to survive (e.g., loan guarantees to Lockheed). Not surprisingly, Wall Street became pessimistic about the companies and downgraded their stocks...

In light of these changes, in the 1970s many defense firms began seeking sales outside of DoD to reduce their overall dependence on defense contracts while, at the same time, protecting their existing defense programs...

Finally, companies began to limit their exposure to defense spending. Some acquired firms in other industries, and some isolated their defense businesses from their non-defense businesses. The collective impact of all these actions was that the leading firms decreased their dependence on government spending, the subcontractor base declined, and the number of

major builders of certain systems declined. By 1980 many companies appear to have been wary of having defense revenues as a major part of company sales. (p. 23)

## **2. Cost Reimbursement**

Due to the failure of TPP in the 1960s, the use of FFP contracts on development programs was discouraged. In the 1970s, the DoD favored use of CR contracts on large R&D projects because of the uncertainties and cost growth experienced from FP contracts (Fox, 2003).

In his book, *Acquisition of Defense System*, Przemieniecki, J. (1993) explains the contract type trends of the 1970s:

Based on the large overruns encountered under McNamara, Packard also moved the DoD back towards CR and incentive contracting. This, unfortunately, did little to help control the cost overruns that DoD was experiencing. Packard left office in 1971, dissatisfied with the lack of success of most of his initiatives. (p. 15)

## **3. Significant Cases: F/A-18 Hornet**

The F/A-18 Hornet program started in 1976 with a production schedule of 1,377 aircraft and soon experienced significant cost growth. The cost increases resulted in multiple program redesigns and fluctuations in procurement quantities (GAO, 1980). There are several factors that caused the cost growth in F/A-18 Hornet program, such as contractor production problems, difficulties in system development, and unforeseen factors (GAO, 1980).

In his paper, *Requirements and Cost Stability: A Case Study of the E/A-18 Hornet Program*, CDR Jay D. Bottelson (2011) writes:

the program dealt with several major obstacles in the form of escalation/inflation costs and the inability of the aircraft to meet required specifications. Though the escalation costs did not detract from the ability to see the program through to the end, they gave the perception of a program that was not being managed properly and was being deliberately understated in order to continue to receive funding. Additionally, though the performance shortcomings did not stop the F/A-18 from achieving

IOC and success in the fleet, concern remains over the reasoning behind accepting less than what was called for in the contract specifications. (p.401)

#### **4. Acquisition Reform Initiatives**

##### ***a. Blue Ribbon Defense Panel (Fitzhugh Commission), 1970***

As Defense Acquisition continued to face cost growth, schedule delay and performance shortfalls on major weapon system procurement, in 1970, the Blue Ribbon Defense Panel (Fitzhugh Commission) was appointed (Fox, 2011, p. 40).

Ethan McKinney, Eugene Gholz, and Harvey M. Sapolsky (1994), in their paper, *Acquisition Reform-Lean 94-03* described the Fitzhugh Commission as follows:

In 1970 the Fitzhugh Commission met for the first time. The Fitzhugh Commission involved the first detailed examination of the weapons development process by an independent, government-sponsored panel. As such, it offered a number of recommendations for changing the development strategies the Services followed.

In contrast to the two Hoover Commissions, the Fitzhugh Commission spent little time on commodity items or joint purchasing and instead focused firmly on weapon systems. The Fitzhugh Commission was also the first major commission to address the political environment of defense acquisition, if only in a limited way, with a warning that Congress was developing a tendency to micromanage the DoD. (n.p.)

In its report, the Fitzhugh Commission appeared to analyze the existing major weapon system acquisition process from industry's point of view. This report also noted that overall deficiencies in acquisition process as a whole create the basis for cost overrun, schedule delay and performance shortfalls and blamed the existing acquisition directive, Directive 3200.9 from Secretary of Defense Robert S. McNamara (Fox, 2011, p. 64).

##### ***b. Commission on Government Procurement, 1972***

The Commission on Government Procurement provided recommendations that led to the establishment of the Office of Federal Procurement Policy (OFPP) and what was to become the Federal Acquisition Regulation (FAR). The OFPP plays a major role in providing overall guidance and direction for government procurement policies,

regulations and procedures and to promote efficiency and effectiveness in government acquisition processes. The OFPP reviews and makes appropriate changes to the FAR periodically to maintain consistency with law and administration policy.

**c. *Arming America: How the U.S. Buys Weapons, by J. Ronald Fox, 1974***

*Arming America: How the U.S. Buys Weapons* encompasses the entire weapons acquisition process from the initial idea to its operational deployment. The book was intended as a follow-on to the two Harvard Business School books by Peck and Scherer published some ten years earlier. Fox cites past success in the procurement of weapon systems as predicated upon thorough grounding in technology, financial management, and military operations. He also calls upon members of Congress for more responsible spending practices (Fox, 1974).

**d. *The Defense Resources Board, 1979***

The Defense Resources Board of 1979 consisted of high ranking officials, including assistant and undersecretary levels, that played a major advisory role to the OSD providing overall oversight and supervision of resource allocation of DoD. Its Steering Group issued Planning, Programming, and Budgeting System (PPBS) review report, which eliminated the restriction of service input limited only to the CJCS. The board also functioned to make sure that all the major programs are complying with the PPBS and provide a solution to the problems when necessary. However, due to the lack in statutory authority, the board can only provide recommendations and had no authority unless specifically approved by the deputy SECDEF (Fox, 2011, p. 105).

**e. *The DoD Resources Management Study, 1979***

The DoD Resources Management Study (DRMS) of 1979 examined the relationship of the systems acquisition process to the resource allocation process of PPBS. The DRMS was prepared by the SECDEF in response to the request from the President. The DRMS reviewed the defense resource allocation process and four specific

functions; weapon system acquisition, logistic support, enlisted personnel management and military health which resources involve directly to the defense capabilities (Rice, 1979, p. vii).

## **D. 1981–1990: FP PERIOD, THE REAGAN BUILDUP PERIOD**

### **1. Background**

#### ***a. Defense Environment***

The U.S. defense budget rapidly increased in response to deal with rise of Soviet Union, as they continued to boost its armed forces. DoD TBA averaged \$528 billion (FY2011 Constant Dollars) during this period, 31 percent more than the previous Post McNamara Period (National Defense Budget Estimate, 2011). As the U.S. defense budget deficits grew, many defense acquisition reforms were initiated and ran throughout the 1980s (Butrica, 2001).

In 1981, The Carlucci 32 Acquisition Initiatives was issued to promote effectiveness and efficiency of Acquisition processes. The Carlucci 32 Acquisition Initiatives was followed by the Packard Commission, which added legislative oversight to the Acquisition process. (Butrica, 2001) In 1984, Competition in Contracting Act (CICA) was issued to promote full and open competition in all federal acquisition programs.

#### ***b. Industry Environment***

In the 1980s, two technologies were introduced by industry: the personal computer and the space shuttle (Butrica, 2001, p. 199). These breakthrough technologies would influence advances in major weapon systems.

In his paper *The U.S. Defense Industrial Base; Past, Present and Future*, Watts (2008), describes the defense industry during this timeframe well:

The 1980s began with major increases in defense spending by the Reagan administration. By 1985, more than two million industry jobs were added. However, several events then sparked a major change in the industrial base. First, defense spending began declining in 1985, reducing the overall revenues of companies. This decline was to continue unbroken until 1998,

long enough to overcome any initial beliefs that the downward trend would reverse after a few years. Second, the government instituted policy and legal changes that altered the ability of companies to make profits even as their sales declined. These changes included cuts in progress payments, changes in tax laws, and demands that companies fund investments that the government had previously funded. While periodic declines in DoD spending were an understandable cyclical aspect of being in the defense industry, these other actions aggravated the decline by affecting how the companies managed their internal operations in order to maintain profitability. They also highlighted the government customer's monopolistic power over companies. Third, parts of the DoD—in violation of the Defense Department's own policies—placed more and more of the risks of developing and producing systems on contractors, while still reserving the right to change requirements or alter production quantities. (p. 24)

## **2. Fixed Price**

In the early 1980s, the Packard's directive, favoring CR contract for development program, was overridden by the Secretary of Navy promoting use of FP contract for large development weapon system programs (Fox, 2001, p. 24). As a result, FP contracts were widely used for USN shipbuilding. As the shipbuilding industry faced greater competitions with declining commercial market, many shipbuilders focused on getting contracts from the military and often had to bid low or below cost to capture the scarce USN contracts. The low bid from the shipbuilder contributed initial cost saving for USN, however; in the long run, it resulted in cost overrun, above the target cost, on 19 of the 22 USN contracts (Sacilotto, 2011, p. 692).

The preference of FP contract on development programs in the 1980s once again resulted in great financial losses for both DoD and industry and caused the schedule delay in weapon systems that DoD needed (Fox, 2001, p. 24). In response to mitigate the cost overrun on FP contracts, Congress, in 1987, expressed restricting the use of FP contracts for large development program in its continuing appropriations legislation (Sacilotto, 2011, p. 685). The National Defense Authorization Act for Fiscal Year 1989 further restricts DoD from using FP contract for development programs.



### **3. Significant Case: A-12 Avenger II**

The A-12 contract, awarded in 1988, is one of the most noteworthy contracts of the 1980s. The A-12 was a full scale Engineering and Development (E&D) FPIF contract with 40/60 ratio. The total target price was approximately \$4.38 billion with \$4.77 billion of ceiling price (Sacilotto, 2011, p. 694).

Due to the complex specifications required by USN, the A-12 program experienced serious engineering problems and cost overruns exceeding \$2 billion that led to delays in schedule. As poor performance, not meeting specification, and schedule delays continued, the USN issued a cure notice to the contractor in December 1990. The contractor, Lockheed, failed to correct the problems and refused to continue the contract unless DoD provided additional funding. As a result, in January 1991, DoD issued a termination for default to the contractor for cost overruns over \$2 billion and for failure to deliver or make progress. In June 1991, the contractor challenged the USN's decision to terminate for default based on the unreasonable and unenforceable schedule requested by USN. Lockheed claimed the A-12 production schedule was commercially impossible to perform, while the USN failed to disclose superior knowledge on the aircraft (Sacilotto, 2011, p. 695). The A-12 program still remains with ongoing litigation to this day and maintains the distinction as the largest contract termination in DoD history.

### **4. Acquisition Reform Initiatives**

#### ***a. The Carlucci 32 Acquisition Initiatives, 1981***

In 1981, Frank Carlucci, Deputy Secretary, implemented 32 initiatives to improve cost efficiencies and removed wasteful steps to streamline the acquisition process. Carlucci believed that too much regulations and oversights ruined the efficiency in acquisition and urged the services to prevent further fraud, waste and mismanagement in contracting (Hinnant, 1993, p. 5). However, the services' efforts to implement Carlucci's initiatives were not successful. His initiatives did not last long due to a lack of support from the Congress. Although DoD implemented the initiatives, there was no definite driving power behind them (Hinnant, 1993, p. 5).

**b. *Special Panel on Defense Procurement, 1982***

In CRS Report, R41293, Schwartz (2010) states:

In 1981, Representative Dave McCurdy, then chair of the House Armed Services Committee Special Panel on Defense Procurement Procedures, held a series of hearings examining weapon system cost growth. According to Representative McCurdy, the intent of the panel was to identify and recommend a method which will allow the Congress to more effectively review and evaluate cost categories for major weapons systems. Subsequently, Senator Nunn and Representative McCurdy led an effort to permanently enact the reporting requirements established in the FY 1982 Defense Authorization Act. In the Department of Defense Authorization Act of 1983 (96 Stat. 718), Congress passed a modified version of the FY 1982 reporting requirements. On September 8, 1982, President Ronald Reagan signed into law the Department of Defense Authorization Act of 1983 (P.L. 97-252), which included what has come to be known as the Nunn-McCurdy Act. (p.22)

**c. *The Defense Industry, by Jacques S. Gansler, 1982***

In his book, *The Defense Industry*, Gansler investigates the total U.S. defense industry with a focus on the post-Vietnam era. He finds that the United States government does not recognize the defense industry as valuable national resource and proposes seven primary solutions:

- Coordination of government policies, sector by sector.
- Integration of civilian and military operations.
- Recognition of the dual economy.
- Policies to address international interdependence.
- Improved planning for productions surge.
- Cost as a major design and acquisition criterion.
- Institutionalization of industrial-base considerations (Gansler, 1982, pp. 261–279).

**d. *Grace Commission, 1983***

The Grace Commission of 1983 was a management reform initiated by Office of the Counsel to the President, to avoid wasteful public spending. The Grace

Commission criticized Congress for the excessively complex regulations and micromanaging in DoD major weapons acquisitions program (Gholz et al., 1994).

*e. The Competition in Contracting Act, 1984*

The Competition in Contracting Act of 1984 (CICA) imposed competition in government contracting. The principle of CICA is to promote competition and increase cost savings through the competitive prices provided by competitors. The CICA required the contracting officer to obtain full and open competition whenever possible and reduced the use of sole-source.

*f. President's Blue Ribbon Commission on Defense Management (Packard Commission), 1986*

The Packard Commission of 1986 is the extension of Grace Commission that asked all the Acquisition participants such as government, the services and the defense industry to work together to improve business practices. Specific guidance to achieve this harmony was not addressed (Gholz et al., 1994). In 1989, SECDEF Cheney reported that implementation of Packard Commission's recommendation within DoD was found to be ineffective, as the implementation was not moving fast enough (et al., 1994).

*g. The Defense Management Challenge, by J. R. Fox, 1988*

Fox examines why Defense Acquisition is so resistant to change. He addressed what actually happens when the government assumes the job of managing large, highly technical programs under contract with industry. Fox found that of the people directly involved in the Defense Acquisition process, those with the most widely differing perceptions of the current conditions of the process are government and industry managers (Fox, 1988, p. 303). Another fundamental issue in the management of defense programs, Fox found, was the need for greater funding stability and more effective long-range defense planning (Fox, 1988, p. 304). Fox believed the organizational changes brought about by the Packard Commission had little positive influence on Defense

Acquisition. Additionally, he concluded that the Program Management concept should be reexamined and that the acquisition workforce needed to be further developed (Fox, 1988).

***h. Affording Defense, by Jacques S. Gansler, 1989***

*Affording Defense* focuses on the high cost of national security and the challenges of meeting that goal while practicing prudent fiscal management. Gansler states, “There is a large gap between America’s *actual* national-security capability and the *posture* statements and assertions of American policymakers” (Gansler, 1989, p. 2). Solutions include weapons-acquisition reform, industry revitalization, and budget areas for potential savings. Gansler identifies potential annual savings of \$50 billion, saying, “The dollars saved must be used to strengthen the United States’ capability to contain regional conflicts and to give the United States a more balanced conventional-warfare capability in Central Europe, so that we would not have to use nuclear weapons in a conflict there” (Gansler, 1989, p. 345).

***i. New Weapons, Old Politics, by Thomas L. McNaugher, 1989***

McNaugher examined how bureaucracies and political structure hampered defense procurement. McNaugher highlighted how the needs of American politics, more than the needs of technology, have come to shape the strategies for developing arcane and uncertain technologies. McNaugher called for changes that ran against the current fashion and showed how the United States tried to buy R&D cheaply, and how costly this cheap approach has become (McNaugher, 1989).

***j. Defense Acquisition Workforce Improvement Act (DAWIA), 1990***

DAWIA required DoD to established education programs and standards for the defense acquisition workforce (Cooper, 2002, p. 12).

## **E. 1991–2008: CR PERIOD, THE POST COLD WAR PERIOD**

### **1. Background**

#### *a. Defense Environment*

With the end of the Cold War and Gulf War, U.S. political leadership turned their eyes to domestic issues and, in turn, a reduction in defense spending (Shiman, 2001). The size of the Armed forces declined and experienced budget reduction within DoD (Shiman, 2001). Between 1991–2008, DoD TBA declined by 7 percent from the previous period, though R&D spending expanded as a percentage of TBA from the previous period by 2.2 percent (National Defense Budget Estimate, 2011). DoD wanted new technologies for new enemies while spending less. As was apparent during the previous CR period (The Post McNamara Period), National Security objectives did not appear to align with the reality of a reduced defense budget.

In addition to the acquisition reform of the mid-1980s, acquisition reform accelerated in the 1990s as responsible reformers and dedicated their time to continue the reform efforts in the DoD—services were also asked to align with these reform efforts (Shiman, 2001). New regulations were promulgated to better train the acquisition workforce and to promote better acquisition practices. Most of the reform efforts in the 1990s and 2000s were focused on managerial efficiencies due to the lack in general resources (Shiman, 2001).

#### *b. Industry Environment*

SECDEF Aspen’s meeting in 1993, commonly referred to as the “Last Supper,” with industry executives created major consolidation and shrinkage within the U.S. defense industry. This consolidation resulted in the emerging of the “Big Five” of U.S. defense contractors: Boeing, Lockheed Martin, Northrop Grumman, General Dynamics, and Raytheon (Watts, 2008, p. 31).

In the early 2000s, defense contracting fundamentally shifted, contracted services emerged as a more prominent force within the defense industry. In his book, *Democracy’s Arsenal*, Jacques S. Gansler (2011) writes:

...the overall Department of Defense procurements shifted to 60 percent services. In just three years, the number of service-contract actions grew from about 325,000 in 2001 to over 600,000 by 2004, and over the same time periods, the number of federal professional service contractors grew from 45,000 to 83,000....

...there are two major causes for shifts in the workforce mix: (1) services have become a majority of the functions being performed in the defense industry, and (2) blue collar manufacturing jobs has decreased significantly as the high cost of weapons systems and their increasing complexities have resulted in far fewer of them, both in types and in quantity. (pp. 46, 235–236)

## **2. Cost Reimbursement**

In March 1991, Eleanor Spector, Director of Defense Procurement within the DoD, restricted use of FP R&D contracting due to the negative consequences of the inappropriate use of FP. (Sacilotto, 2011, pp. 696–697) In her article, “*Déjà vu All over Again: Cost-Reimbursement Contracts Fall out of Favor Again, But Should They?*” Kara Sacilotto (2011) states:

By the mid-2000s, however, these consequences were no longer on Congress's radar. In 2006, in the John Warner National Defense Authorization Act for Fiscal Year 2007 (FY 2007 NDAA), Congress repealed the ban on fixed-price developmental contracts it had put in place through its FY 1989 NDAA. In addition to lifting the ban, section 818 of the 1989 NDAA requires the Secretary of Defense to adopt revised regulations for selecting contract type for major defense acquisition programs (MDAPs). (pp. 696–697)

## **3. Significant Case: F-35 Joint Strike Fighter**

The F-35 Lightning II, the Joint Strike Fighter (JSF), is the most expensive and ambitious aircraft acquisition within the DoD today. JSF used CR type contracts through development and production. Lockheed Martin is responsible for the entire JSF program with support from the Pratt and Whitney for its engine manufacturing. JSF adopted a “single step” acquisition strategy to develop full-combat capabilities. Its development schedule was very aggressive and its development risk was considerably high (GAO, 2010a, p. 3).

The JSF program faced its major challenges with cost overrun. A GAO report (GAO-10-382) states that JSF suffered from both cost overrun and schedule delays. The estimated acquisition costs were increased \$46 billion from the baseline approved in 2007 and the development schedule was extended two more years. As a result, the JSF program is at risk of not meeting the quantities and capabilities as planned. As of March 2010, the unit costs of JSF exceeded established cost thresholds and violated the Nunn-McCurdy provision which required DoD's explanation to Congress. (Clark, 2010) Due to the continuous manufacturing problems, in 2009, only four out of 13 test aircraft was delivered and only 10 percent of the planned sorties were completed for the flight test program. Based on JSF's manufacturing inefficiencies, lack the maturity and engineering technical changes, the independent manufacturing review team concluded that the planned production rate was unachievable.

As DoD continues to invest more funds to maintain the JSF program, the risk is now at DoD by the nature of CR contracts with low production rate. GAO report (2010a) recommended DoD to submit plans to mitigate the risks of using CR procurement and suggest converting the CR type contract to FP contract as JSF program are beyond the R&D phase.

#### **4. Acquisition Reform Initiatives**

##### ***a. Advisory Panel on Streamlining and Codifying Acquisition Laws Pursuant to Section 800 of the National Defense Authorization Act for Fiscal Year 1991***

The Advisory Panel on Streamlining and Codifying Acquisition Laws was created in response to Section 800 of the National Defense Authorization Act, and its report entitled to improve government's rights on commercial technologies and reducing administrative overhead.

In his paper, *The Ghosts of Acquisition Reform: Past, Present and Future*, Reeves (1996) states:

Section 800 of the Fiscal Year 1991 National Defense Authorization Act directed the DoD to establish the Acquisition Law Advisory Panel. Taking its cue from the Packard Commission, this panel was directed to "review

all acquisition laws applicable to the DoD and make recommendations for repeal or amendments of laws unnecessary to the buyer-seller relationship.” After reviewing some 600 laws, the panel issued a 1,800 page report detailing specific changes or elimination of each law reviewed. Key recommendations included simplifying acquisition procedures for procurements under \$100,000, new definitions allowing the DoD to act as a commercial purchaser, new thresholds on socio-economic programs, and eliminating TINA requirements for procurements under \$500,000. (p.22)

***b. National Performance Review (NPR), 1993***

National Performance Review of 1993 focused on efficiency that makes government to work better and cost less. Vice President Gore submitted the report *From Red Tape to Results: Creating a Government That Works Better and Costs Less* on 7 September 1993. His report provided 384 recommendations including acquisition reform and other measures for anticipated savings of \$108 billion (Gordon, 1994).

***c. Defense Science Board (DSB) Defense Acquisition Reform Study (Phase I), 1993***

Phase I of the Defense Acquisition Reform Studies identified “the need to replace the current practices of conducting the acquisition of DoD’s products and services with world class or best of class commercial practices.” (DSB, 1996) The most important aspect is the integration of defense and commercial industrial base. The fully integrated commercial industries with R&D and production resources to the DoD will promote economic growth and industrial competitiveness and improve the U.S. economy overall. The report firmly acknowledged the need to adopt commercial practices as a way of doing business and developed a set of reform initiatives designed to accelerate the required changes (DSB, 1993, p. i).

***d. Defense Science Board (DSB) Defense Acquisition Reform Study (Phase II), 1994***

Phase II of the Defense Acquisition Reform Studies further defined the required actions to achieve efficiency in Defense Acquisition reform in Phase I by identifying the obstacles to adopting commercial practices. (DSB, 1994) The report identified “specific industry segments for commercialization, identified specific



combatant commands for increased responsibility in the requirements process, and further defined the barriers to the adoption of commercial practices within DoD acquisition” (DSB, 1996). Finally, the board believes that it is possible to achieve increased commercial practices without sacrificing the public trust in spending taxpayer’s dollars (DSB, 1994).

*e. Federal Acquisition Streamlining Act (FASA) of 1994*

The 1994 FASA affected many areas of the acquisition process. The FASA eliminated many restrictions, acquisition laws and regulations that used to impede the streamlining the procurement process. FASA emphasized use of commercial items and practices. Use of commercial item to the maximum extent practicable reduces costs and attracts nontraditional companies, those companies reluctant to do business with government due to complex business requirements required by government, to government contracting. FASA provided acquisition workforce personnel with streamlined procurement processes with the establishment of Simplified Acquisition Procedures (SAP). Lastly, the requirements for Cost and Pricing Data were exempted for the commercial item procurement.

*f. Defense Conversion, by Jacques S. Gansler, 1996*

In this book, Jacques Gansler (1996) addresses restructuring the defense industry after the end of the Cold War by integrating civilian and military operations. He recommended sixteen specific government actions that could achieve civilian and military integration. The sixteen recommendations are:

- Establish a clear vision statement and a strategy.
- Achieve some early successes.
- Expand the definition of commercial specifically to encompass commercial facilities.
- Make a weapon’s price a part of the military-acquisition requirement.
- Recognize that each sector of the defense industrial base is dramatically different.

- Establish a true preference for commercial specifications and standards in all DoD designs and manufacturing operations.
- Prohibit passing down defense-unique rules to lower-tier suppliers.
- Implement significant changes in the DoD's R&D practices.
- Require contractor support of logistic activities as the norm.
- Dramatically reduce defense industry overhead.
- Create incentives for firms to move to integrated facilities.
- Revise many of the Justice Department and Federal Trade Commission antitrust rules if the downsizing process is to be rational.
- Give consideration to the special financial problems associated with the capital investment situation in the defense industrial base.
- Implement widespread shift from today's lengthy and cumbersome.
- Government contract award process to a modern, electronic-data-exchange.
- Procurement system.
- Implement a government-civilian manpower reduction plan.
- Have explicit institutional mechanisms to monitor the progress of the cultural transformation (p. 232).

***g. Defense Science Board (DSB) Defense Acquisition Reform Study (Phase III), 1996***

Phase III of the DSB Defense Acquisition Reform Studies concentrated on examining the feasibility of extending “best-of-class practices to the R&D phase of a system’s acquisition.” Researchers concluded that the current acquisition process should be replaced, and that the R&D phase of military systems should adopt best commercial practices. The Task Force recommended that “The DoD acquisition system must provide a continual competitive environment whereby military hardware and software are developed and procured using world-class processes” (DSB, 1996).

***h. Clinger-Cohen Act of 1996***

The Clinger-Cohen Act of 1996 made further advances on initiatives implemented under FASA. Some of the most important changes amended the Simplified

Acquisition Procedure (SAP) and commercial items procedures, permitted efficient competitive range determination, and changed Information Technology Acquisition Processes.

The Clinger-Cohen Act broadened the definition of commercial items and eliminated certain certifications required by law. The legislation also initiated an examination of procurement laws and regulations potentially inconsistent with acquiring commercial products. It also exempted COTS items from Cost-Accounting Standards (CAS) and from the submission of cost and pricing data required under TINA.

*i. Reexamining Military Acquisition Reform, RAND Corp., 2005*

In 2005, the RAND Corporation published this study that examined acquisition reform and acquisition excellence initiatives undertaken in the DoD over the period 1990 to 2003. In the DoD, 63 distinct acquisition reform initiatives were undertaken from 1989 to 2002. By looking at what the acquisition reform movement was in the 1990s, and by letting acquisition personnel describe in their own words how their work was affected by those initiatives, this significant acquisition reform seeks to shed light on what the acquisition reform movement has and has not accomplished in terms of changing the way the acquisition process works (Fox, 2011, p. 181).

Unlike Acquisition Reform initiatives in 1980s, which was to reduce waste, fraud and abuse in defense contracting, the major focus of Acquisition Reform initiatives during the 1990s was to find the ways to streamline the acquisition process. This study also examined to identify which Acquisition Reform initiatives have been incorporated into the curriculum of the Defense Acquisition University (Hanks, Axelband, Lindsay, Malik & Steele, 2005, pp. 3–4).

*j. Comparative History of DoD Management Reform, NPS, 2006*

This study analyzes the history of management reform within the DoD from 1947 to 2006 based on the annual reports of the SECDEF to Congress.

***k. OSD Defense Acquisition Performance Assessment (DAPA), 2006***

The Defense Acquisition Performance Assessment initiative was established by Acting Deputy Secretary of Defense Gordon England in a 7 June 2005 memo. He directed “an integrated acquisition assessment to consider every aspect of acquisition, including requirements, organizational, legal foundations like Goldwater-Nichols, decision methodology, oversight, checks and balances every aspect.” (Spring, 2005, p. 1) In the end, the DAPA Panel proposed the way to improve the DoD’s ability and integrate key elements of the acquisition system, such as acquisition workforces, requirements, budgets and industry (DoD DAPA, 2006).

***l. John Warner Defense Authorization Act of 2007***

In 2006, in the John Warner National Defense Authorization Act for Fiscal Year 2007, Congress lifted the ban on FP developmental contracts and required SECDEF to implement revised acquisition process in selecting contract type for major weapon systems revised regulations (Sacilotto, 2011, p. 697).

***m. Commission on Army Acquisition and Program Management in Expeditionary Operations, 2007***

In this study, researchers reviewed recent operations and provided forward-looking recommendations to ensure that future military operations achieved greater effectiveness, efficiency, and transparency.

***n. Defense Acquisition: Options for Congress, CRS, by Stephen Chadwick, 2007***

In this report, Chadwick provided an outline of the DoD’s defense acquisition structure and discussed the most recent major reports addressing defense acquisition and the DoD’s defense acquisition transformation efforts. Chadwick also included a description of some significant issues for the 110th Congress to consider, as well as some recommendations for addressing those issues.

## **F. 2009–PRESENT: FP PERIOD, THE PRESENT PERIOD**

### **1. Background**

#### *a. Defense Environment*

In 2009, with numerous GAO reporting on criticism of cost growth on major weapon systems, President Obama issued a Presidential Memorandum on government contracting to find efficiency and preferable contracting type. The President noted the dollars obligated on CR contracts were doubled from FY 2000 to FY 2008 (Sacilotto, 2011, p. 700). According to the President’s memorandum, avoiding sole-source and CR contracts to the maximum extent can save billions of dollars each year. In order to save taxpayer’s dollars, the President issued the orders to the director of the OMB to eliminate possible wasteful and inefficient contracts and cancel them if necessary. The memorandum favors FP contracts and limits the CR contracts to the minimum possible (Sacilotto, 2011, p. 701).

DoD TBA since 2009 has averaged \$704 billion, comparable to the preceding two years. However, the TBA for the previous period averaged 43 percent less on average and 13 percent less than the average TBA the previous period following 9/11 (National Defense Budget Estimate, 2011).

#### *b. Industry Environment*

Following the financial crisis of 2008, GDP fell 2.5 percent in 2009, though expanded by 4.2 percent the following year (BEA, 2011). Such an economic contraction, along with drawdown to troops in Iraq and Afghanistan, indicate a short-term future that may be challenging for the defense industry.

### **2. Fixed Price**

To meet the President’s directives, OMB issued “Memorandum for the Heads of Departments and Agencies.” The goal of this memorandum was to improve government acquisition, to perform a review on all existing contracts and acquisition practices, and to save 7 percent of baseline contract spending by the end of FY 2011 (Sacilotto, 2011, p. 701). In return, OFPP came up with guidelines in October 2009 stating FP contracts

are the preferred method, and if managed right, FP contracts can provide better incentive than CR contracts for the contractor to control cost and performance (Sacilotto, 2011, p. 702). Furthermore, the OFPP advised all government agencies to find the opportunities to convert from CR contracts to FP contracts where possible.

On September 14, 2010, Dr. Ashton Carter, USD (AT&L), issued guidance to DoD acquisition professionals to improve efficiency and control cost growth on all DoD acquisition programs. One of his main guidance to the DoD was the use of FPIF contracts with 50/50 share ratio between contractors and government and a 120 percent ceiling price limit (Sacilotto, 2011, p. 704).

Over the last two decades, the contract type preferred by government has come full circle from limiting the use of FP contracts for major weapon system acquisition to favoring FP contracts requiring a written justification, if FP contract is not selected (Sacilotto, 2011, p. 700).

### **3. Acquisition Reform Initiatives**

#### ***a. National Defense Authorization Act (H.R. 4986/P.L. 110-181), 2008***

This act included a provision on future contracts for the use of new Lead System Integrators for major systems.

#### ***b. DoD Instruction 5000.2, 2008***

This report included updated instruction, including a mandatory requirement for competitive prototyping, more emphasis on systems engineering and technical reviews, and a requirement that all programs go through an MDD process prior to entering the acquisition system.

#### ***c. Joint Capabilities Integration and Development System (CJCSI 3170.01G), 2009***

In this report, researchers streamlined the requirement-validation process and expanded the role of the Joint Capabilities Board. They also recommended that combatant commanders be more involved in establishing requirements.

*d. Weapon Systems Acquisition Reform Act of 2009*

The Weapon Systems Acquisition Reform Act (WSARA), passed in May 2009, was an important step to address many of the existing problems in defense acquisition process and requirements development. The WSARA emphasized getting things right from the beginning with identifying realistic requirements, accurate cost estimation, and promote competition in major weapon systems (Sacilotto, 2011, p. 709). The WSARA consists of changes on organization, acquisition policy and congressional reporting requirements and provides guidance how these three major objectives can be achieved.

*e. DSB: Creating a DoD Strategic Acquisition Platform, 2009*

This report provides recommendations to the SECDEF based on previous reports from the DSB. The reports states, “Today, the defense acquisition process takes too long to produce weapons that are too expensive and often technically outdated by the time they are field” (DSB, 2009, p. 1).

The DSB (2009) report summarizes the key elements of a strategic acquisition platform as follows:

- Buy the right things, guided by national security objectives.
- Select an effective leadership team—in the office of the Secretary of Defense, the military departments, and defense agencies—with proven, relevant experience. Ensure alignment among senior leadership to DoD goals and timely support of major acquisition decisions.
- Reform acquisition with efficient processes for major systems, information technology systems, and to rapidly field critical war fighting needs, especially in times of crisis.
- Improve acquisition execution—management of product development, contract award and management with credible contractor teams and contracts, right sizing and training the acquisition workforce, acquisition integrity, and acquisition performance metrics.
- Enlist Congress as part of the solution to provide the legislative support needed to succeed (p. 39).

*f. CNA Independent Assessment: Air Force Acquisition, 2009*

The CNA report on Air Force Acquisition was prepared by the retired high rank military and civilian official with substantial experience in managing acquisition program. From the mid-1990s, the AF has experienced the cost overrun, schedule delay and performance problems with its acquisition system and processes (Christle, Davis & Porter, 2009, p. 3). This report was consisting of two broad categories with six topic areas. The major findings from this report were the failure of the USAF community to treat defense acquisition as a profession in the USAF and failure of AF leadership to enforce acquisition policies, procedures and hold subordinates accountable (Christle et al., 2009, pp. 5–6).

*g. Implementing Management for Performance and Related Reforms to Obtain Value in Every Acquisition (IMPROVE) Acquisition Act of 2010*

The IMPROVE Acquisition Act was intended to reform the remaining 80 percent of the defense acquisition system that was not addressed by the Weapon Systems Acquisition Reform Act.



THIS PAGE INTENTIONALLY LEFT BLANK

## V. ANALYSIS

### A. INTRODUCTION

Most analysis of contract type for major weapons systems has been addressed across historically short periods of time. The analysis approach of this paper covers sixty-three years and is based on the assumption that a larger the sample size will yield more meaningful data.

Defense Acquisition is a complex process that has evolved as the DoD's requirements and environment have changed. Analysis of long-term trends may lead researchers to conclusions across the entire time scale. Researchers may also find a meaningful point in time from which to base further research.

### B. CONTRACT TYPE TRENDS

Figure 7 reflects trends in predominant contract type across DoD total budget authority<sup>2</sup> (TBA) years since 1947. Firstly, use of FP contracting appears to coincide with larger defense budgets. Secondly, entrance and exit point to FP period coincide closely to increases and decreases in DoD TBA. Thirdly, during the years 1950–1952 the DoD TBA fluctuates wildly.

---

<sup>2</sup> Starting in 2001, DoD TBA also begins including supplemental funding for the Global War on Terror (GWOT). Some of this money has gone into RDT&E and procurement, but it is difficult to depict how much is in relation to the traditional appropriations categories (RDT&E, procurement, military personnel, etc. (Watts, 2008, p. 11).

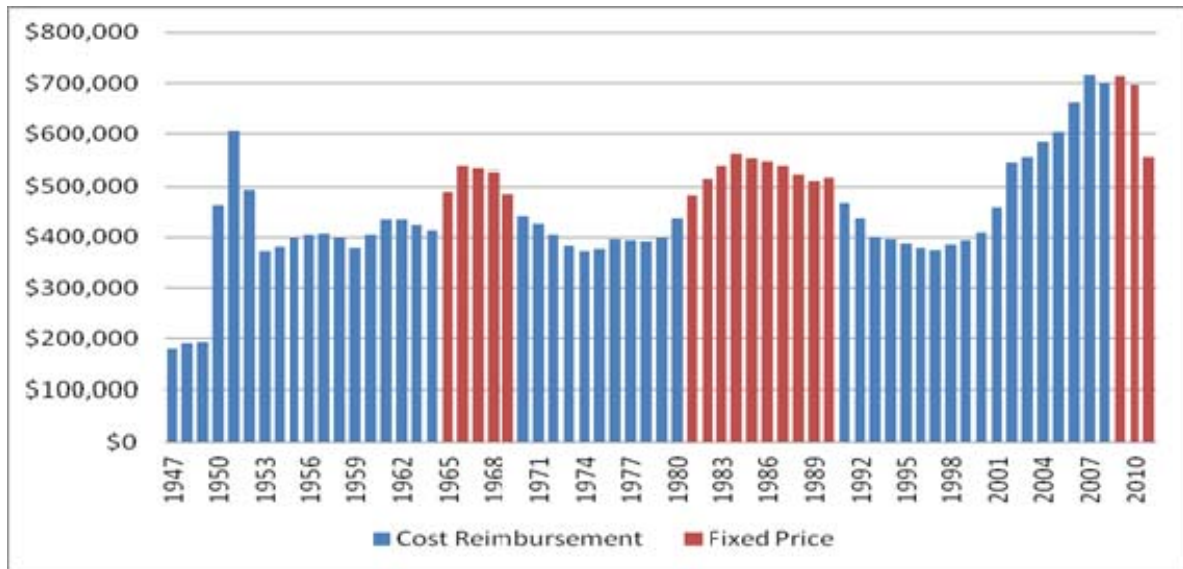


Figure 7. DoD TBA by Contract Type Period (Millions of Constant FY 2011 Dollars). (From National Defense Budget Estimates for FY 2012)

The average defense budget for FP periods over time has been \$545B (constant FY 2011 dollars), while the average defense budget for CR periods over time has been \$431B (constant FY 2011 dollars). Thus, FP periods average 26 percent greater DoD TBA than during CR periods.

Since 1947, 30 of the 64 years have seen a declining defense budget. Consider the three years before each contract type period and the first three years within that contract type period. The three FP periods initially show budget growth of 22 percent, 25 percent, and a most recent decline of 6 percent. The two CR periods initially show declines of 18 percent and 16 percent. The first three years of a FP period have seen increases in DoD TBA averaging 13.9 percent, vice 9.8 percent growth in the prior three year period. The first three years of the most recent FP period, beginning in 2009, was the first time a FP period began with a declining defense budget at -5.6 percent.

The three years, from 1950–1952, encompass the Korean War years. A shift in preference for a certain contract type likely did not occur due to the brevity of the conflict and due to a lack of development in new weapon systems. At no other period across the

spectrum does the defense budget fluctuate so violently. FP periods correlate closely to higher DoD TBA with the most recent FP period occurring some six years later than the two previous FP periods.

**C. DEPARTMENT OF DEFENSE**

**1. Budget Category**

Figure 8 reflects three defense budget categories relevant to the Acquisition of major weapon systems as a percentage of DoD TBA. The three budget categories are R&D, procurement, and operations and maintenance (O&M). Firstly, procurement funds as a percentage of DoD TBA has varied cyclically across time, while O&M and R&D funding have more gradually increased as a percentage of DoD TBA. Secondly, the years preceding each FP period appear to have experienced an increase in procurement funding.

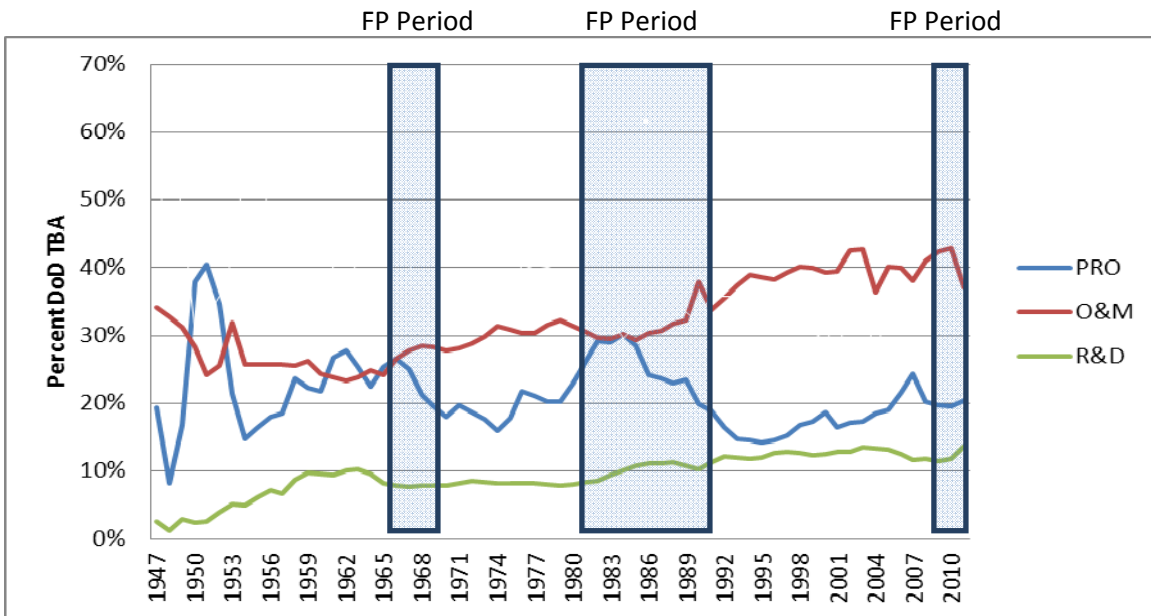


Figure 8. Relevant Budget Categories as a Percentage of DoD TBA. (From National Defense Budget Estimates for FY 2012)

On average, procurement funding has been greater as a percentage of DoD TBA for FP periods, 24 percent, vice 20 percent during CR periods.

Procurement funding appears to increase considerably preceding each FP. From start to finish every CR period has experienced an increase in procurement funding by an average increase of 3 percent of TBA. Inversely, every complete FP period (not including the current FP period) has experienced a decrease in procurement funding by an average decrease of 6 percent of TBA. Troughs occur shortly before the mid-point in each CR period, while procurement funding has peaked within 2 (2007), 3 (1962), and 4 (1984) years of a new FP period.

Both greater DoD TBA and procurement funding occur more regularly during FP periods. More notably, an expanding procurement budget has acted as a leading indicator of a new FP period.

## 2. Major U.S. Military Conflicts

Consider the requirements placed on the DoD. Figure 9 shows major combat operations since 1947.

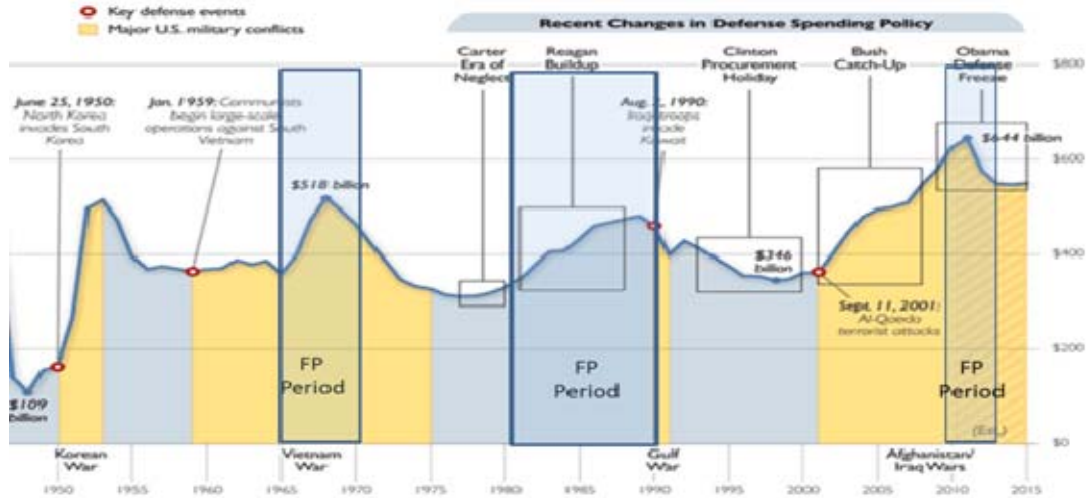


Figure 9. DoD TBA & Major U.S. Military Conflicts (Billions of Constant FY 2011 Dollars). (From U.S. Office of Management and Budget, Historical Tables, Budget of the United States Government, Fiscal Year 2011, Table 3.1)

DoD TBA has grown on average 53 percent from the year prior to major combat operations to the average DoD TBA during the ensuing operation. The average DoD TBA for times of combat operations is \$506B, vice \$417B during times of peace. Following major combat operations DoD TBA has fallen 16 percent from the average of the preceding operation. Understandably, TBA increases significantly during periods of war.

There appears to be little correlation between the contract type period and war years with 51 percent of CR years occurring during a time of war and 49 percent of FP years occurring during a time of war. FP contracts average annual DoD TBA of \$545B, vice \$506B for years of major combat operations.

On average, DoD TBA is greater during FP periods than during periods of major combat operations. FP periods have consistently corresponded with years of greatest DoD TBA, irrespective of major combat operations.

## **D. THE DEFENSE INDUSTRY**

### **1. Gross Domestic Product (GDP)**

Figure 10 shows U.S. GDP growth annualized as a percentage across contract type periods. During CR periods GDP has grown at an average annual rate of 6.7 percent, while FP periods grew at an average annual rate of 7.0 percent. During CR years GDP growth was above the overall 6.8 percent average 63 percent of the time. During FP years GDP growth was above average 59 percent of the time. GDP rate of growth reflects negligibly to either contract type period since one is slightly better on average and the other reflective of slightly more sustained GDP growth.

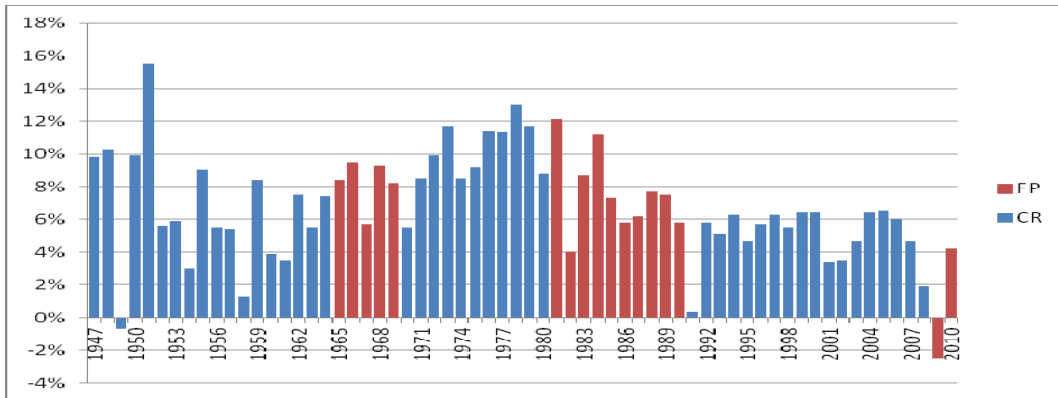


Figure 10. GDP percent Growth by Contract Type Period. (From U.S. Bureau of Economic Analysis)

From Q1 2009 to Q1 2012 GDP growth rate averages 3.0 percent annualized. Since Q1 2008 that rate is 1.8 percent annualized, much less than the 6.8 percent average GDP growth rate since 1947.

In order to illustrate the relation of contract type to percent GDP growth Figure 11 uses GDP percent growth using a five year moving average. FP contracting appears to be preferred shortly after a period of an expansion or decline in the rate of GDP growth. Apparently, policy makers have not consistently used GDP growth as a factor for preferring one contract type over another.

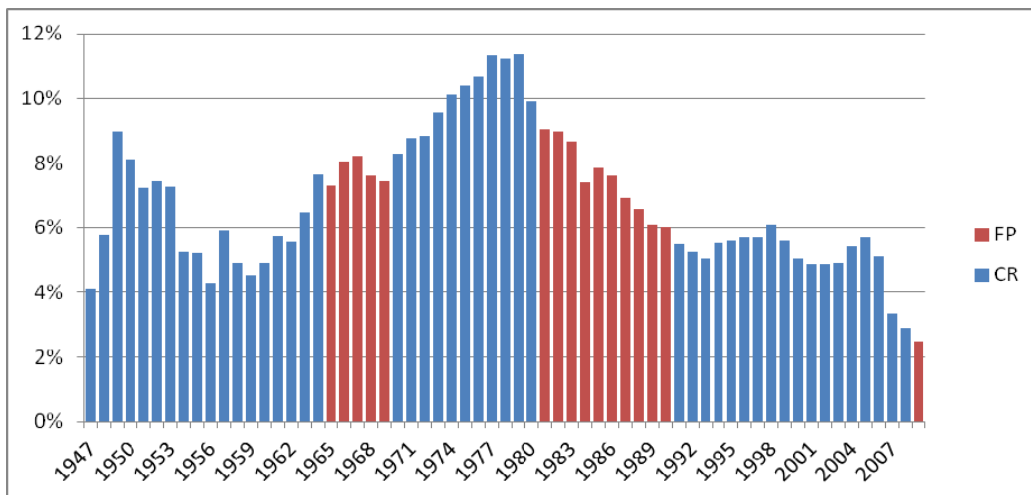


Figure 11. GDP percent Growth using 5-yr MA. (From U.S. Bureau of Economic Analysis)

Possibly, the size of government receipts, related to shifts in GDP growth rate, corresponds to contract type periods. Figures 12 and Figure 13 show no discernable connection between government receipts and occurrence of contract type periods. Figure 12 shows government receipts as a percentage of GDP by contract type periods. Figure 13 shows gross government receipts in constant FY 2005 dollars by contract type period.

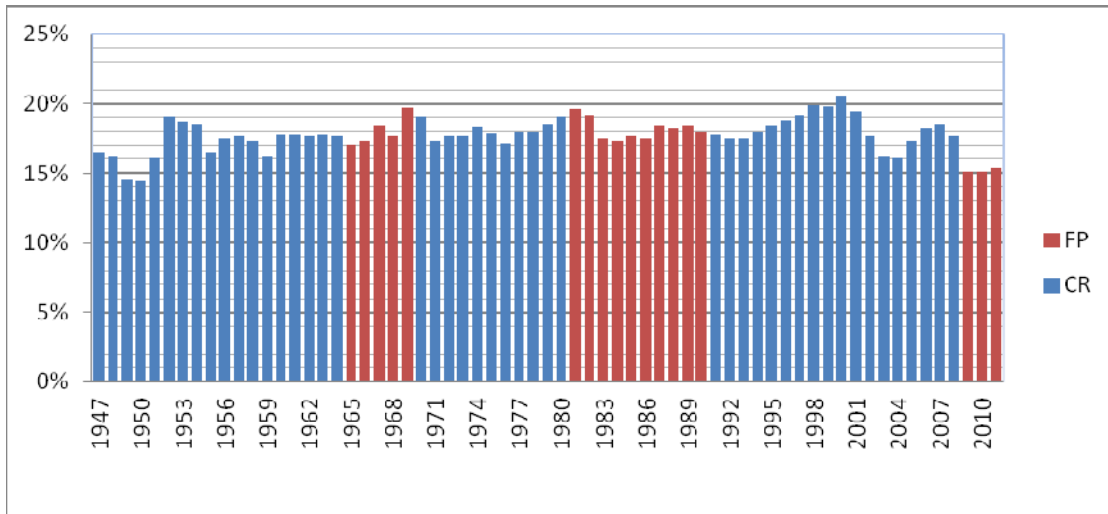


Figure 12. Receipts as a Percentage of GDP. (From Office of Management and Budget, Historical Tables)

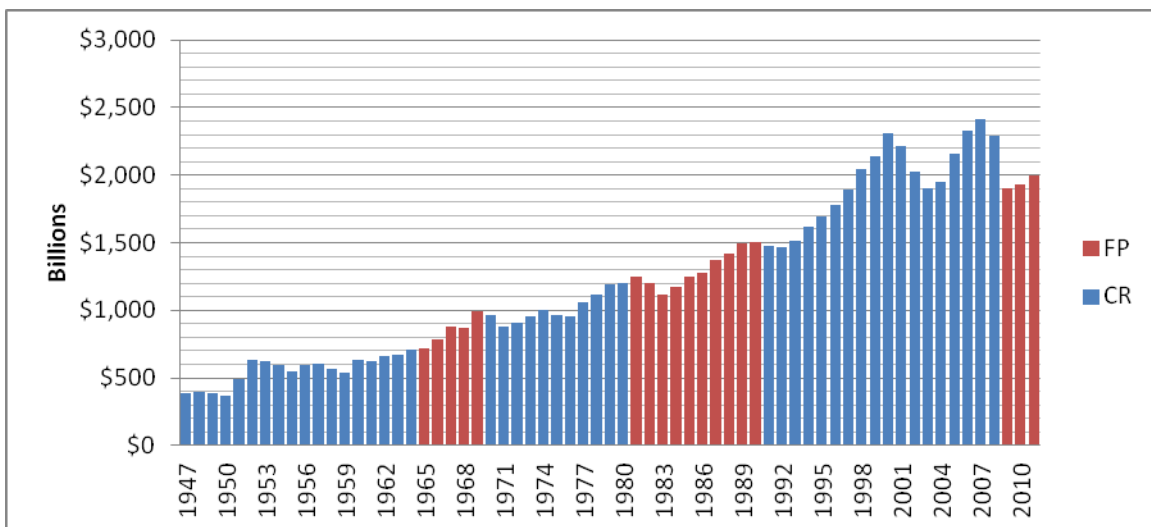


Figure 13. Federal Receipts (Billions of Constant FY 2005 Dollars). (From Office of Management and Budget, Historical Tables)



DoD TBA and procurement funding as a percentage of DoD TBA appear to be better indicators of a shift in contract type than do macroeconomic measures such as GDP growth or federal receipts. Economic factors controlled by the government appear to be better indicators of shifts in contract type periods. A lack of correlation between contract type periods and macroeconomic factors indicates that these factors are poor indicators of the entrance or exit trigger points to FP or CR period.

## 2. Defense Industry Periods

Figure 14 shows GDP percent change across Watts' Defense Industry periods. Each of these three periods appears to reflect a correlation in relative movement between GDP percent growth and defined periods during which the defense industry changed. The "Growth" period experienced volatile GDP growth. The "Mature" period experienced sustained high GDP growth that returned to an average rate. The Restructuring period experienced stable GDP growth slightly below the 6.8 percent average since 1947.

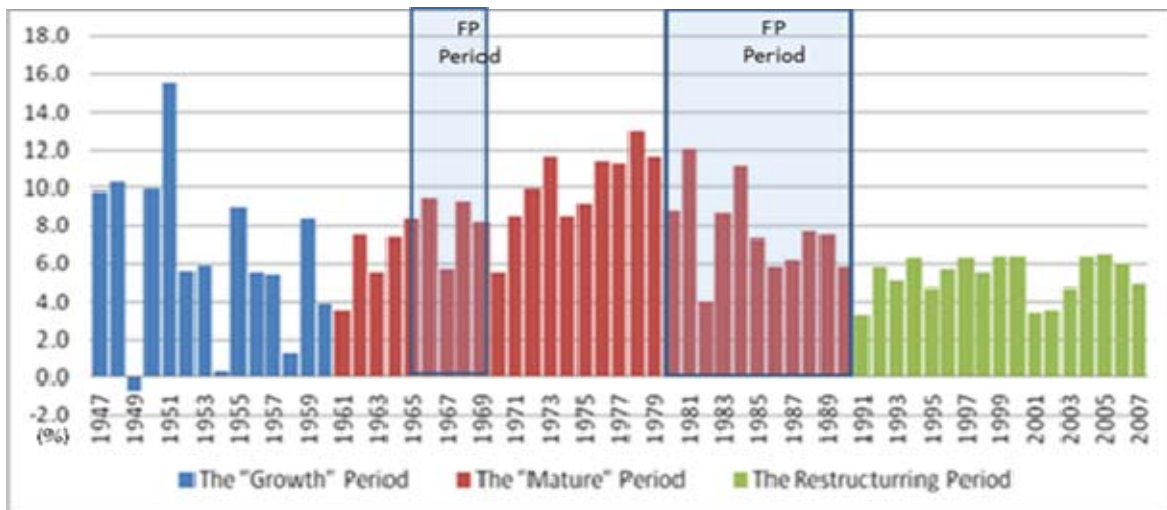
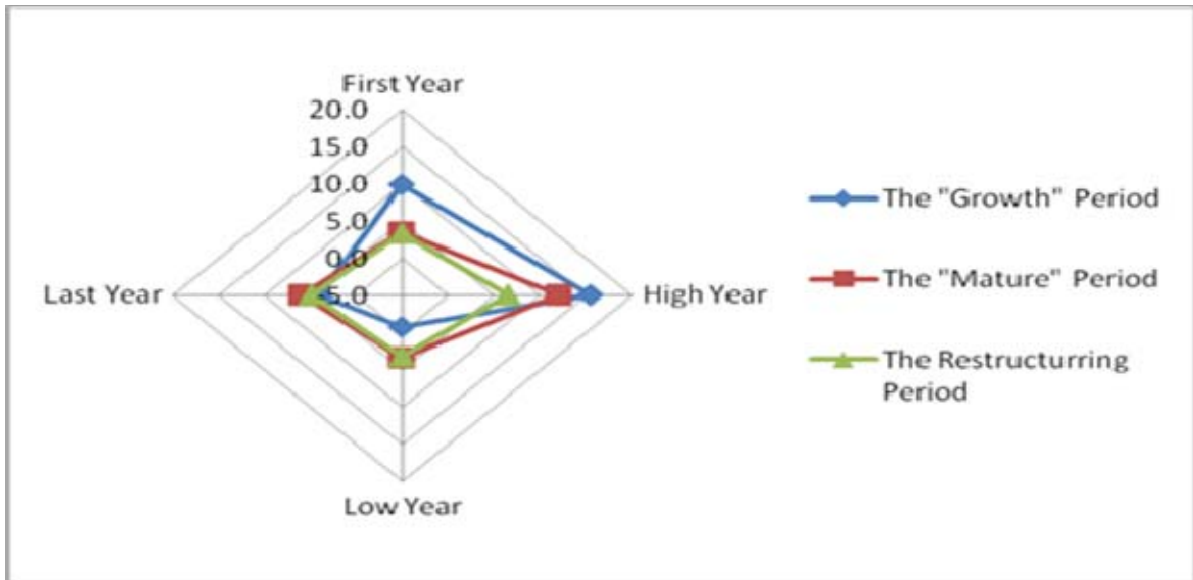


Figure 14. GDP percent Change across Watts' Defense Industry Periods. (From U.S. Bureau of Economic Analysis)

Figure 15 alternately shows how Watts' Defense Industry periods vary by volatility of GDP. The smaller area of the most recent Restructuring Period reflects less variation in GDP growth, particularly with lower high GDP growth years.



	First Year	High Year	Low Year	Last Year
The "Growth" Period	9.8	15.5	-0.7	3.9
The "Mature" Period	3.5	12.1	3.5	5.8
The Restructuring Period	3.3	6.5	3.3	4.9

Figure 15. Variations in GDP Growth During Watts' Defense Industry Periods.  
(From U.S. Bureau of Economic Analysis)

Average GDP growth has progressed by industry period from 6.4 percent to 8.4 percent to 5.4 percent, while the DoD TBA has progressed by industry period from \$376B to \$466B to \$480B, see Figure 16. Apparently, the amount of defense spending and the stability of the U.S. economy had more to do with forming the current defense industry than average GDP growth has. The defense industry surely is insulated against greater economic forces.

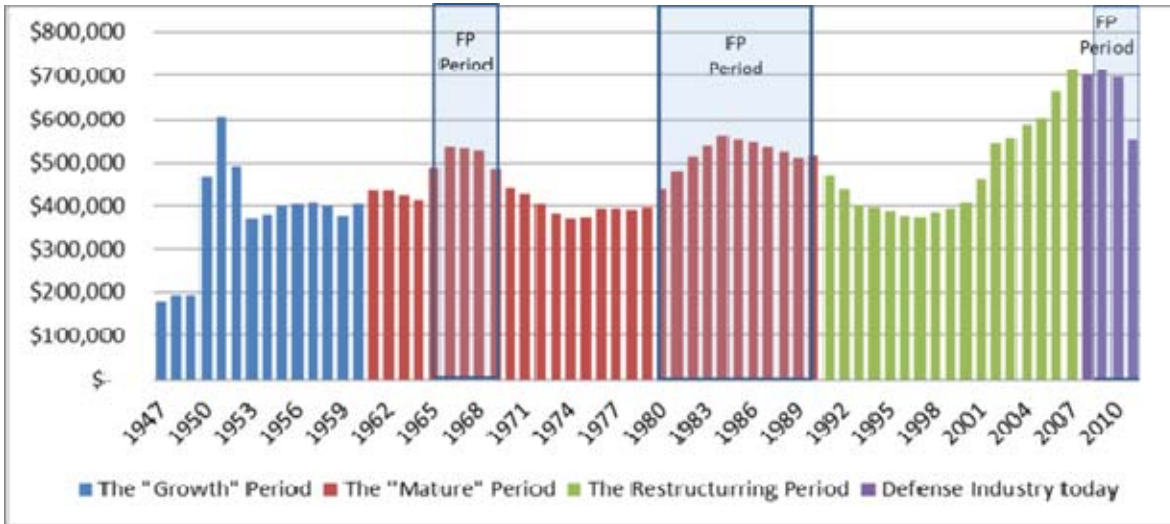


Figure 16. DoD TBA across Watts' Defense Industry periods (Millions of Constant FY 2011 Dollars). (From (National Defense Budget Estimates for FY 2012)

Figure 16, DoD TBA across Watts' Defense Industry periods, is used to analyze shifts within the defense industry relative to shifts in contract type period. Transition points between contract type and Defense Industry periods match for 1991. In 1991, a CR period was beginning as was the Restructuring period for the Defense Industry. Secondly, the "Mature" period begins in 1961, four years before a FP period begins in 1965.

Of the four major conflicts since 1947, only once did the entrance or exit of the conflict correspond to a change in preference for contract type. That period was in 1991 when the first Gulf War ended. That is, just once in seven opportunities did change in contract type period correspond to the entrance or exit of a conflict period. Furthermore, if the transition point between contract type periods is expanded by five years before and five years in either direction shows no better a correlation between entrance or exit to major conflicts and transitions between predominant contract type. In fact, the five years of the TPP Period between 1965–1969 restricts showing any less of a correlation.

The year 1991 appears to indicate a point in time where both the government and the defense industry changed. In 1991, a CR period began, procurement funding as a percentage of DoD TBA bottomed, GDP growth rate began to level off, and Watts'

Restructuring Period began. Other than in 1991, since the DoD formed in 1947 structural changes within the defense industry have not aligned consistently with contract type periods.

**E. DEFENSE MARKETPLACE TRENDS**

**1. Workforce**

Figure 17 reflects changes to the size of the total defense industry between 1947–2006. Firstly, the number of “Defense Related Employment in Industry” shadowed the number of military until the early 1980s when the size of employment in industry outnumbers the size of the military. Since the year 2000, total military and DoD civilians have remained relatively stable, while the defense related employment in industry has grown by 48 percent. Secondly, the size of “Defense Related Employment in Industry” seems to increase relative to DoD TBA.

Employment in industry averages 20 percent greater during FP periods than during CR periods. FP periods have, thus, experienced 20 percent greater employment in industry and 26 percent greater DoD TBA than during CR periods.

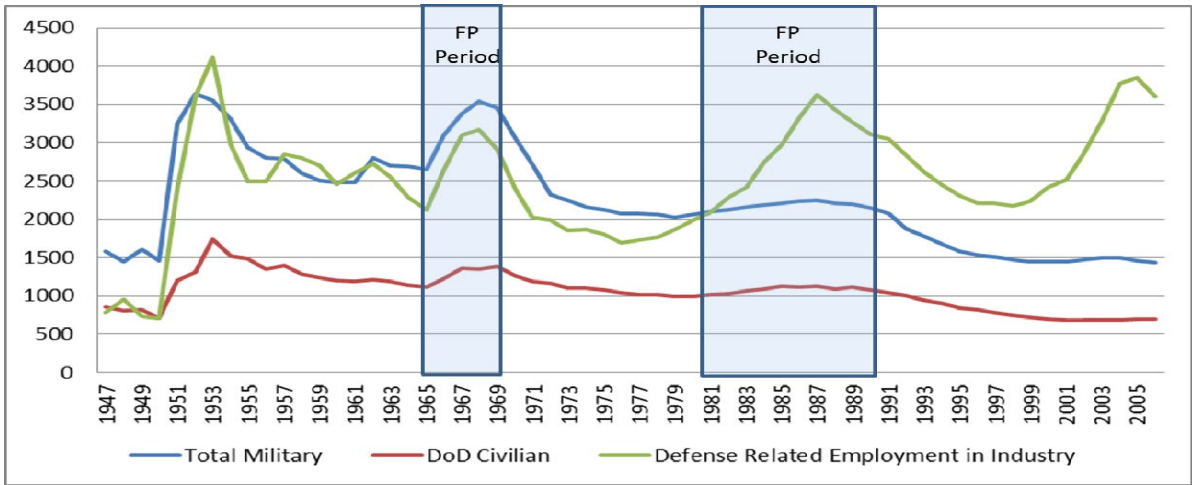


Figure 17. Total Defense Marketplace Workforce. (From National Defense Budget Estimates for FY 2006)

Figure 18 reflects the DoD workforce as a percentage of total federal employment. Aside from the drastic increase in workforce during the Korean War years, the DoD workforce appears to expand during the two previous FP periods, first in 1966, then again in 1981. Since the most recent FP period began in 2009, military and DoD civilians have not noticeably increased as a percentage of the size of the total federal workforce.

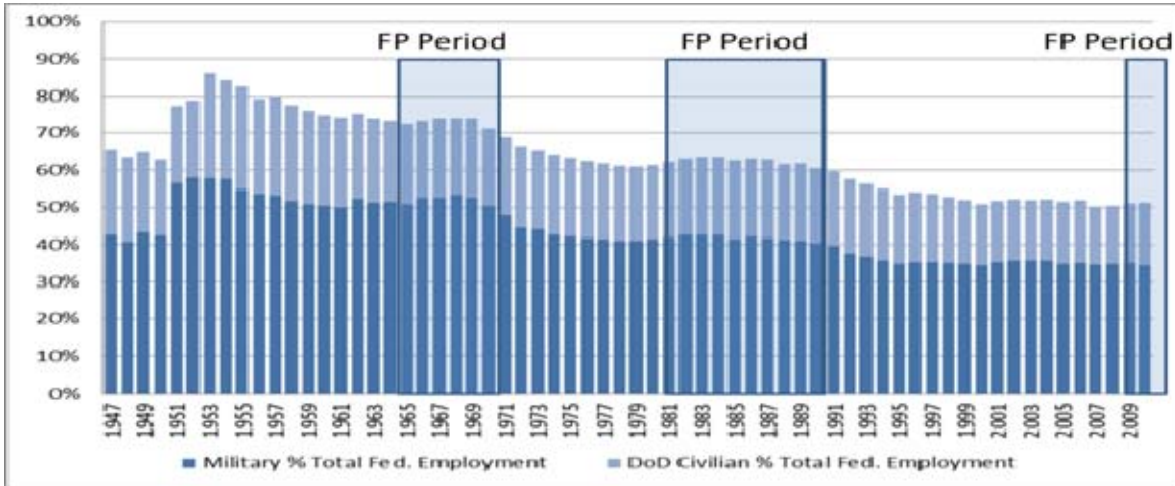


Figure 18. DoD Workforce percent Total Federal Workforce. (From National Defense Budget Estimates for FY 2012)

Table 4 shows that on average the size of the military and DoD civilian workforces have made up a larger portion of the total federal workforce during periods of FP contracting. Military was 4.4 percent greater on average, DoD civilian were 2.2 percent greater on average. Combined DoD made up a larger portion of the federal workforce by 6.5 percent during FP periods.

Table 4. DoD Workforce Percent Total Federal Workforce. (Authors)

	Cost Reimbursement	Fixed Price	<i>Delta(FP)</i>
Military	46.6%	51.0%	4.4%
DoD Civilian	21.9%	24.1%	2.2%
Total DoD% Federal	68.6%	75.1%	6.5%

The total combined defense marketplace workforce (total military, DoD civilian, and defense related employment in industry) averages 18 percent greater during FP periods than during CR periods: 6,564 to 5,571. See Figure 19.

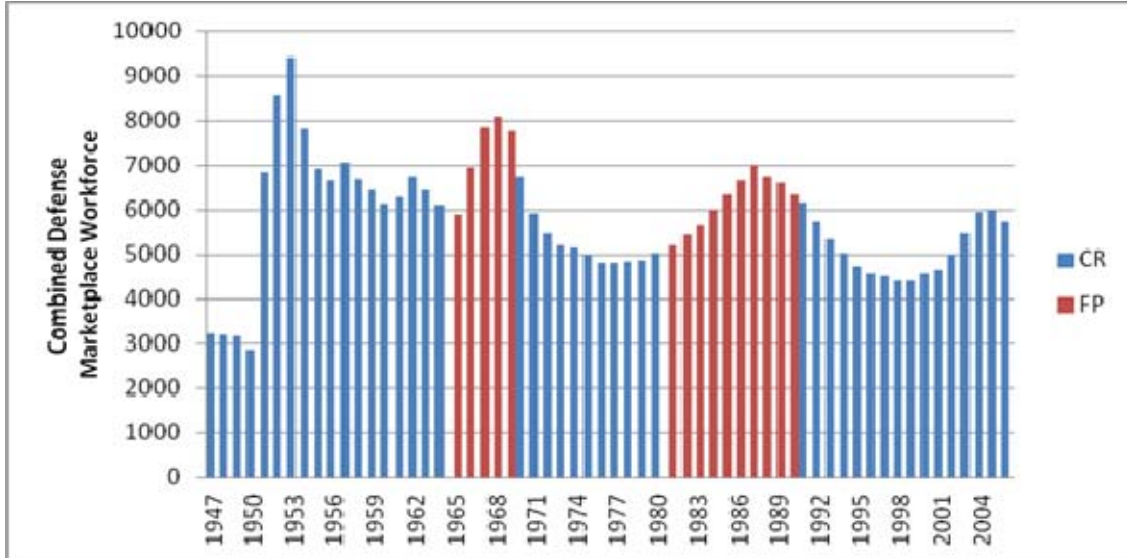


Figure 19. Combined Defense Marketplace Workforce. (From National Defense Budget Estimates for FY 2006)

FP periods have historically experienced greater DoD TBA by 26 percent and a larger defense marketplace workforce by 18 percent, been defined by entrance and exit points that correspond to increases and decreases in DoD TBA (with the most recent FP period occurring some six years later than would have been expected), and been preceded by procurement funds increasing as a percentage of DoD TBA.

FP periods have shown little relation to periods of major military conflicts, changes in GDP growth or federal receipts, and periods of structural change within the defense industry.

THIS PAGE INTENTIONALLY LEFT BLANK

## VI. CONCLUSION

### A. ANSWERS TO RESEARCH QUESTIONS

#### 1. Primary Research Question

**Is the most recent preference, beginning in 2009, for fixed price contracting historically consistent with prior trends?**

The most recent preference for FP contracting is mostly inconsistent with prior trends; use of historic indicators of FP periods would have predicted an earlier start to the current FP period. Four data points suggest the timing for the most recent FP period is inconsistent with previous FP periods.

- FP periods historically coincide with defense budgets that are 26 percent larger than during CR periods. Considering the current drawdown to major combat operations in Iraq and Afghanistan DoD TBA would be expected to drop by around 16 percent based on the funding level changes following previous major combat operations. Higher DoD TBA correlates even closer to FP periods, 26 percent, than to periods of major combat operations, 17 percent.
- The previous two FP periods began at the start of large increases of TBA and ended after TBA peaked (see Figure 7). The current FP period began near the peak of an expanding DoD TBA cycle. Historical trends for DoD TBA would have predicted a FP period beginning around 2002.
- Fifty-nine years of data suggests that a larger size of the defense marketplace workforce correlates closely to periods of FP contracting and a greater DoD TBA. The defense industry workforce has been 20 percent larger during FP periods. However, from 2000–2006, the defense industry workforce had already grown by 48 percent before the most recent FP period began in 2009. The current higher combined defense marketplace workforce corresponds to previous FP periods; however, the current shift to the FP preference is several years later than the other FP transitions.
- The current proportion of procurement funding to DoD TBA resembles a budget composition of a CR period. Recently, procurement funds peaked at 24 percent in 2007 and have leveled off around 20 percent since. Procurement funds during CR periods historically averaged 20 percent of DoD TBA. Procurement funds average just over 24 percent of DoD TBA for FP periods.



One data points suggest that this most current FP period aligns with previous FP periods.

- The gradual increase in procurement funding as a percentage of DoD TBA corresponds to similar FP shifts preceding the previous FP periods. Expanding procurement funding may be a leading indicator of FP periods.

Today's declining defense budget, drawdowns in major combat operations, an apparently declining defense industry workforce, and smaller procurement budget run counter to the timing when previous FP periods were deemed appropriate. However, a gradually increasing procurement budget that preceded the current FP period shows similarity between the current and previous FP periods.

## **2. Our Secondary Research Questions Include the Following**

**What are the historical leading indicators for the Department of Defense's cyclical preference for certain types of contracts?**

The indicator that best predicts change in preference for contract type appears to be an extended expansion of the procurement budget as a percentage of DoD TBA preceding FP periods. See Figure 8.

- **Is the DoD's fixed-price contract preference responsive to changes in total defense budget authority?**

Growth in DoD TBA appears to align closely with shifts in preference towards FP contracting. During the previous two FP periods, the three years prior to a shift in preference towards FP contracts saw DoD TBA grow by an average of 24 percent (22 percent and 25 percent) when compared to the first three years of the FP period. The three years, years four thru six preceding the shift to FP contracts, saw DoD TBA grow by an average of just 5 percent (5 percent and 5 percent), which indicates that DoD TBA has typically begun to rise more the three years before a shift towards FP contracts. See Figure 7.

Contrary to previous trends, since the beginning of the most recent FP period in 2009 the DoD TBA has declined by 6 percent. However, if the shift in preference

towards FP contracting would have happened earlier (2002), then there would have been a similar increase in DoD TBA, of 33 percent, to the historical average increase of 24 percent DoD TBA.

- **Is the DoD's fixed-price contract preference responsive to prevailing trends in acquisition reform literature?**

The timing of acquisition reform initiatives does not appear to correlate closely to changes in contract type preference; however, cultural trends, based on published American literature using the Google Ngram Viewer tool, shows an interrelationship between key acquisition terms and contract type preference.

Usage of *contract type* in American literature appears to be a leading indicator of FP periods (aside from the Clinton administration Defense Acquisition reform initiatives in the early 1990s).

Acquisition policy and culture show less correlation following the initial FP period between 1965–1969. The first FP period, or TPP period, coincided with *fixed price contract* appearing in print some 30 percent more than at any point in time since. Published debate on FP contracting appears to have peaked during the initial FP period forty-five years ago and has leveled off since.

Cost type contracts are generally discussed in print much less than fixed price contract. In fact, use of *fixed price contract* correlated closely to contract type usage in American literature from 1948–2000. Since around 2000, American culture appears to have shifted attention away from *FP contracts* and away from *major weapon systems*.

- **Is the DoD's fixed-price contract preference responsive to growth or decline in the economy?**

FP contracting preference appears to be implemented during initial periods of expansion or decline in rate of GDP growth. Since the late 1980s GDP growth rate has remained in a consistent range. Thus, the recent change in preference towards FP contracts appears influenced more by other factors than by the rate of growth in the U.S. economy.

- **Is the DoD's fixed-price contract preference responsive to growth or decline in the defense industry?**

FP periods correlate closely to periods of higher defense related employment in industry (see Figure 17). Since 1947, employment in industry averages 20 percent greater during FP periods than during CR periods. Greater employment within the defense industry and a larger DoD TBA has aligned closely with the first two FP periods. The current FP period was preceded by a 48 percent expansion of the defense industry workforce from 2000–2006. The historical trend of employment in industry would have predicted a FP period beginning in the early 2000s.

## **B. CONCLUSION**

FP contracting shifts risks from the government to the contractor by locking in a set price and provides the contractor strong incentive to control costs. FP periods have historically followed shortly after an expanding DoD budget has begun. As the defense budget has expanded, policy makers have attempted to take measures to prevent waste of government funds. Thus, the DoD has appeared to emphasize FP contracting in response to pressures to control costs, while prospects were greatest for the defense industry.

High-profile contracts for major weapon systems that have experienced significant cost, schedule, and/or performance issues have repeatedly marred the DoD and the defense industry. Public awareness through published literature of *contract type* correlates closely to FP periods, while *fixed price contract* usage in American literature peaks during the same timeframes. Coincidentally, the larger defense budgets that have historically aligned with FP periods have inadvertently encouraged public scrutiny of defense spending practices. An increased public focus on defense contracting, and an increased DoD TBA, both appear to influence acquisition policy towards FP contracting.

Each contract type period appears to end with a public and dramatic case that demonstrates some of the negative impacts of a particular contract type. Certain conditions tend to be present for a particular contract type period to be established. As the lone buyer within the defense industry, the DoD sets market conditions from which current and future requirements are met.

Factors set by the government, such as DoD TBA and budget composition, reflect overwhelmingly how self-imposed conditions have contributed to an acquisition environment that cyclically shifts preference for a certain contract type. For example, FP periods correlate closer to a larger defense budget than to periods of major combat operations or to GDP growth rates.

FP periods appear predicated mostly upon the following two factors: DoD TBA and the expansion of procurement funding as a percent of DoD TBA. FP periods historically coincide with defense budgets that are 26 percent larger than during CR periods. FP periods typically have defined entry and exit points that correspond to increases and decreases in DoD TBA. Preceding all FP periods, procurement funding has increased as a percentage of DoD TBA. Procurement funding appears to be the best leading indicator for FP periods, though, a declining procurement budget during FP periods may yet prove to be as good as, or better, indicator for shifts in preference back to CR periods. Just as procurement funding has consistently increased preceding FP periods, procurement funding too has consistently declined preceding CR periods.

Historic contract type preference strongly contradicts FAR guidance. FAR 16.103(b) states, “A firm-fixed price contract, which best utilizes the basic profit motive of business enterprise, shall be used when the risk involved is minimal or can be predicted with an acceptable degree of certainty.” FAR 16.301-2 states that cost-reimbursement contracts are appropriate when “uncertainties involved in contract performance do not permit costs to be estimated with sufficient accuracy to use any type of fixed-price contract.” Historically, FP periods have been entered into during periods of increasing TBA and have extended into a period when TBA is declining. Such uncertain budgetary environments have historically been *followed* by a shift in contract type preference to CR contracting. These periods of transition when defense spending is declining represents a time of uncertainty within the defense industry. Uncertainty during such transitional times greatly increases the uncertainty of cost estimates by defense contractors. Additionally, indirect costs are the largest category of cost within a cost estimate (Sondheimer, 2001). A Defense Contract Management Agency Overhead Initiative found that indirect costs composed more than half the value of total work in

process at defense contractor plants (Sondheimer, 2001). Indirect costs may become inflated when TBA is least. During these periods when TBA is declining, and when defense contractors are uncertain of future DoD, business can reduce the allocation base, increasing risk, and potentially increase indirect rates significantly in the cost estimates provided by defense contractors. Furthermore, defense contractors have greater risk in planning the allocation of their resources for efficient production. The preference for FP contracting during the transition from a greater TBA to a reduced TBA may contradict the FAR guidance of choosing a contract type based on a reasonable allocation of risk.

Historic contract type indicators would have predicted an earlier beginning to the most recent FP period. The three-year period following this most recent FP period was the first occasion DoD TBA declined following the start to FP period, by 6 percent. Should the most recent FP period have begun in 2002, the measure showing the greatest correlation to FP periods, DoD TBA, would have aligned more closely to the historical trend for FP periods. The most recent shift towards FP contracts, in 2008, neither occurred where the historical norm would have predicted, nor when contract risk was least to the DoD.

A declining defense budget and a weak economy suggest that the defense industry is not positioned well for the current shift in policy towards FP contracts. A shift towards FP contracts following shortly after 9/11 would have aligned closely with historic indicators. Five historic shifts in contract type preference cast doubt on the effectiveness of such a policy. The logic for a contract type preference seems based less on emerging operational requirements for major weapon systems or FAR guidance, and more as a response to DoD's own spending patterns.

### **C. FOLLOW-ON RESEARCH**

Perform a study:

- That focuses on the specific recommendations of significant Acquisition reform initiatives.

- That specifically analyses historic contract type trends against similar factors beginning in 1953. Funding levels varied wildly during the Korean War years from 1950–1952.
- That specifically analyses historic contract type trends against similar factors beginning in 1991. A new contract type period and defense industry period both appear to begin this year.
- That focuses on the early 2000s. Trends in acquisition culture and the composition of the defense marketplace workforce appear to indicate a fundamental shift.
- Studies that expand the scope of public perception as an indicator of contract type preference.
- Use statistical tools to evaluate the strength of the correlation of the indicators with contract type preference. Further studies to determine if identified indicators have causality as opposed to mere correlation.

THIS PAGE INTENTIONALLY LEFT BLANK

## APPENDIX A

### A. ACQUISITION REFORM INITIATIVES

The acquisition reform initiatives that are used within the analysis of this project are listed below. These initiatives significantly shaped the defense acquisition environment, and, more precisely, influenced the acquisition process for major weapon systems.

1. Commission on the Organization of the Executive Branch of the Government (First Hoover Commission), 1949.
2. Commission on the Organization of the Executive Branch of the Government (Second Hoover Commission), 1955.
3. The Weapons Acquisition Process Study by the Harvard Business School, 1960 and 1962.
4. The Truth in Negotiations Act (TINA), 1962.
5. Blue Ribbon Defense Panel (Fitzhugh Commission), 1970.
6. Commission on Government Procurement, 1972.
7. Arming America: How the U.S. Buys Weapons, by J. Ronald Fox, 1974.
8. The Defense Resources Board, 1979.
9. The DoD Resources Management Study, 1979.
10. The Carlucci 32 Acquisition Initiatives, 1981.
11. Special Panel on Defense Procurement, 1982.
12. The Defense Industry, by Jacques S. Gansler, 1982.
13. Grace Commission, 1983.
14. Competition in Contracting Act, 1984.
15. Center for Strategic and International Studies, 1985.
16. President's Blue Ribbon Commission on Defense Management (Packard Commission), 1986.



17. The Defense Management Challenge, by J. R. Fox, 1988.
18. The Secretary of Defense (SECDEF) Defense Management Review, 1989.
19. Affording Defense, by Jacques S. Gansler, 1989.
20. New Weapons, Old Politics, by Thomas L. McNaugher. 1989.
21. Defense Acquisition Workforce Improvement Act (DAWIA), 1990.
22. Defense Science Board (DSB) Defense Acquisition Reform Study (Phase I), 1993.
23. Defense Science Board (DSB) Defense Acquisition Reform Study (Phase II), 1994.
24. Advisory Panel on Streamlining and Codifying Acquisition Laws Pursuant to Section 800 of the National Defense Authorization Act for Fiscal Year 1991, 1991.
25. National Performance Review (NPR), 1993.
26. Federal Acquisition Streamlining Act (FASA), 1994.
27. Defense Conversion, by Jacques S. Gansler, 1995.
28. Defense Science Board (DSB) Defense Acquisition Reform Study (Phase III), 1996.
29. Clinger-Cohen Act, 1996.
30. Cheaper, Faster, Better?: Commercial Approaches to Weapons Acquisition, RAND Corp., 2000
31. Re-examining Military Acquisition Reform, RAND Corp., 2005.
32. OSD Defense Acquisition Performance Assessment (DAPA), 2006.
33. John Warner Defense Authorization Act, 2007.
34. Commission on Army Acquisition and Program Management in Expeditionary Operations, 2007.
35. Defense Acquisition: Options for Congress, Congressional Research Service (CRS), by Stephen Chadwick, 2007.

36. Duncan Hunter National Defense Authorization Act for FY2009 (S.3001/P.L. 110-417), 2008.
37. National Defense Authorization Act (H.R. 4986/P.L. 110-181), 2008.
38. DoD Instruction 5000.02, 2008.
39. Joint Capabilities Integration and Development System (CJCSI 3170.01G), 2009. Weapon Systems Acquisition Reform Act, 2009.
40. Creating a DoD Strategic Acquisition Platform, DoD DSB, 2009.
41. Center for Naval Analysis (CNA) Independent Assessment: Air Force Acquisition, 2009.
42. IMPROVE Acquisition Act, 2010.

THIS PAGE INTENTIONALLY LEFT BLACK

## APPENDIX B

### A. DEFINITIONS<sup>3</sup>

**Acquisition Category (ACAT)** refers generally to the size, complexity, and risk of an acquisition program.

ACAT I programs are Major Defense Acquisition Programs (MDAPs). An MDAP is a program estimated by the USD(AT&L) that requires eventual expenditure for RDT&E of more than \$365 million (FY 2000 constant dollars) or procurement of more than \$2.19 billion (FY 2000 constant dollars), or those programs designated by the USD(AT&L) to be MDAPs. ACAT I programs may also be those designated by the USD(AT&L) as special interest programs. ACAT I Weapon System programs have two subcategories:

ACAT ID. For this program, the Milestone Decision Authority (MDA) is the USD (AT&L). The “D” refers to the Defense Acquisition Board (DAB), which advises the USD (AT&L) at major decision points.

ACAT IC. For this program, the MDA is the DoD component head or, if delegated, the DoD Component Acquisition Executive (CAE). The “C” refers to Component. The USD (AT&L) designates programs as ACAT ID or ACAT IC.

ACAT II programs are defined as those acquisition programs that do not meet the criteria for an ACAT I program, but do meet the criteria for a major system. A *major system* is defined as a program estimated by the DoD Component Head that will eventually require expenditure for RDT&E of more than \$140 million in FY 2000 constant dollars, or for procurement of more than \$660 million in FY 2000 constant dollars or those designated by the DoD Component Head to be ACAT II. The MDA for this program is the DoD CAE.

---

<sup>3</sup> Definitions are based on DAU definitions and have been slightly modified or updated.

ACAT III programs are defined as those acquisition programs that do not meet the criteria for ACAT II. The MDA is designated by the CAE. This category includes less-than-major AISs.

ACAT IV programs are found only in the Navy and Marine Corps and are designated as such when they do not qualify as ACAT III programs. There are two categories of ACAT IV programs: IVT and IVM. ACAT IVT programs require Operational Test and Evaluation (OT&E), and ACAT IVM programs do not.

**Contract Definition Phase (CDP)** is the definition requirement phase instituted by DoD in the early 1960s in an attempt to obtain lower prices for system development.

**Cost-Reimbursement (CR) Contracts** provide for payment of allowable incurred costs, to the extent prescribed in the contract. The contracts establish an estimate of total costs for the purpose of obligating funds and establishing a ceiling that contractors may not exceed (except at their own risk) without the approval of the contracting officer. CR contracts are suitable for use only when uncertainties involved in contract performance do not permit costs to be estimated with accuracy sufficient enough to use any type of fixed-price contract.

**Cost-Plus-a-Fixed-Fee (CPFF) Contracts** are contracts wherein the contractor is reimbursed for allowable, allocable costs. The contractor's fee is fixed. The price of the contract (or the total amount paid to the contractor) is not fixed.

**Defense Federal Acquisition Regulation Supplement (DFARS)** means the DoD supplement to the Federal Acquisition Regulation (FAR).

**Department of Defense (DoD)** means the Department of Defense, the military departments, and the defense agencies.

**Federal Acquisition Regulation (FAR)** is the regulation for use by federal executive agencies for acquisition of supplies and services with appropriated funds.

**Fixed-Price (FP) Contracts** are contracts that provides for a firm price, or, in appropriate cases, an adjustable price with a limit to government liability. FP contracts providing for an adjustable price may include a ceiling price, a target price (including a

target cost), or both. The contracting officer uses firm-fixed-price contracts or FP contracts with economic price-adjustment contracts when acquiring commercial items. FP contracts place relatively more cost responsibility on the contractor than on the government and makes profit a function of the contractor's ability to manage.

**Firm-Fixed-Price (FFP) Contracts** are contracts where the amount of payment does not depend on the amount of resources or time expended, as opposed to a cost-plus contract which is intended to cover the costs plus some amount of profit. Cost responsibility is placed wholly on the contractor. FFPs are the preferred type of contract when cost risk is minimal or can be predicted with an acceptable degree of certainty.

**Fixed-Price with Economic Price Adjustment (FPEPA)** are contracts used to protect both the government and the contractor when there is serious doubt about the stability of labor or material prices during the life of the contract. Price-adjustment provisions can provide for both upward and downward adjustments.

**Fixed-Price Incentive Fee (FPIF) Contracts** are FP type contracts with provisions for the adjustment of profit. The final contract price is based on a comparison between the final negotiated total costs and the total target costs.

**Fixed-Price Redetermination (FPR)** if prospective, provides for an FFP for an initial period of contract performance and for prospective redetermination, upward or downward, at predetermined stated times during the performance of the contract. If retroactive, the FPR provides for a ceiling price and retroactive price redetermination after completion of the contract.

**Major Defense Acquisition Program (MDAP)** is an acquisition program that is designated by the Under Secretary of Defense (Acquisition, Technology, and Logistics) (USD(AT&L)) as an MDAP, or estimated by the USD(AT&L) to require an eventual total expenditure for Research, Development, Test and Evaluation (RDT&E) of more than 365 million in Fiscal Year (FY) 2000 constant dollars or, for procurement, of more than 2.19 billion in FY 2000 constant dollars.

**The Office of the Secretary of Defense (OSD)** is the principal staff element of the SECDEF in the exercise of policy development, planning, resource management, budget, and program evaluation responsibilities.

**The Program Manager (PM)** is the designated individual with the responsibility and authority to accomplish program objectives for development, production, and sustainment in order to meet the user's operational needs. The PM is accountable for credible cost, scheduling, and performance reporting to the MDA.

**Sole-Source Acquisition** means a contract for the purchase of supplies or services that is entered into or proposed to be entered into by an agency after soliciting and negotiating with only one source.

**Total Package Procurement Concept (TPPC)** is a method of acquisition that involves offering weapon contractors the entire procurement, or the total package, early in the development cycle using a FP contract.

**Weapon System** is a system that can be used directly by the armed forces to carry out combat missions.

**Weapon System Costs** equal the sum of the procurement costs for prime mission equipment and the procurement costs of support items.

## LIST OF REFERENCES

- Berteau, D. J., Ben-Ari, G., Hofbauer, J., Sanders, G., Ellman, J., & Morrow, D. (with Lombardo, N.). (2011). *Cost and time overruns for major defense acquisition programs*. Retrieved from [http://csis.org/files/publication/110517\\_DIIG\\_MDAP\\_overruns.pdf](http://csis.org/files/publication/110517_DIIG_MDAP_overruns.pdf)
- Bottelson, J. D. (2011). *Requirements and cost stability: A case study of the F/A-18 Hornet Program*. Retrieved from [http://www.dau.mil/pubscats/PubsCats/AR%20Journal/arj60/Bottelsoon\\_ARJ60.pdf](http://www.dau.mil/pubscats/PubsCats/AR%20Journal/arj60/Bottelsoon_ARJ60.pdf)
- Bright, C. D. (1978). *The jet makers*. Retrieved from: <http://www.generalatomic.com/jetmakers/chapter6.html>
- Bureau of Economic Analysis (2011, November 1). Retrieved from <http://www.bea.gov/national/index.htm>
- Butrica, A. (2001). *Defense acquisition history project: An overview of acquisition, 1981–1990*. Retrieved from <http://www.history.army.mil/acquisition/newsletters/acq1-3.html>
- Choi, D. (2009). *A study on improving defense acquisition through the application of defense acquisition workforce improvement act (DAWIA) concept to defense industry workforce*. Retrieved from <http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA508936&Location=U2&doc=GetTRDoc.pdf>
- Christle, G., Davis, D., & Porter, G. (2009). *CNA independent assessment: Air Force acquisition*. Retrieved from <http://www.cna.org/sites/default/files/research/D0019891.A2.pdf>
- Clark, C. (2010). Hill gets JSF Nunn-McCurdy. Retrieved from <http://www.dodbuzz.com/2010/03/29/hill-gets-jsf-nunn-mccurdy>
- Conte, C., & Karr, A. R. (2001). *An outline of the U.S. economy*. Retrieved from [http://www.google.com/url?sa=t&rct=j&q=many%20americans%20feared%20that%20the%20end%20of%20world%20war%20&source=web&cd=7&ved=0CFwQFjAG&url=http%3A%2F%2Fguangzhou.usembassy-china.org.cn%2Fuploads%2Fimages%2FqfzH\\_IgIYLkXBEPBkXZxQ%2FOutline\\_of\\_the\\_U.S.\\_Economy.doc&ei=B-HGT5qAHIKu8QSPjr25Cw&usq=AFQjCNHot-lyi5Y-5w8MAQZhhDf7Ps3X8w](http://www.google.com/url?sa=t&rct=j&q=many%20americans%20feared%20that%20the%20end%20of%20world%20war%20&source=web&cd=7&ved=0CFwQFjAG&url=http%3A%2F%2Fguangzhou.usembassy-china.org.cn%2Fuploads%2Fimages%2FqfzH_IgIYLkXBEPBkXZxQ%2FOutline_of_the_U.S._Economy.doc&ei=B-HGT5qAHIKu8QSPjr25Cw&usq=AFQjCNHot-lyi5Y-5w8MAQZhhDf7Ps3X8w)



- Cooper, M. (2002). *Department of Defense implementation of acquisition reform initiatives*. Retrieved from <http://www.dtic.mil/cgi-bin/GetTRDoc?Location=U2&doc=GetTRDoc.pdf&AD=ADA405801>
- Darst, B. A., & Roberts, M. K. (2010). Government contract types. Retrieved from <http://www.ncmahq.org/files/Articles/CM1210%20-%2016-31.pdf>
- Department of Defense (DoD). (2006, January). *Defense acquisition performance assessment (DAPA) Report*. Retrieved from <https://acc.dau.mil/adl/en-US/18554/file/733/Defense%20Acquisition%20Performance%20Assessment%20Report%202006.pdf>
- Defense Science Board, Task Force on Defense Acquisition Reform. (1993, July). *Report of the defense science board task force on defense acquisition reform*. Retrieved from <http://handle.dtic.mil/100.2/ADA268734>
- Defense Science Board, Task Force on Defense Acquisition Reform (Phase II). (1994, August). *Report of the defense science board task force on defense acquisition reform*. Retrieved from <http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA286410&Location=U2&doc=GetTRDoc.pdf>
- Defense Science Board, Task Force on Defense Acquisition Reform (Phase III). (1996, May). *Report of the defense science board task force on defense acquisition reform*. Retrieved from <http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA316651&Location=U2&doc=GetTRDoc.pdf>
- Defense Science Board. (2009, April). *Creating a DoD strategic acquisition platform*. Retrieved from <http://www.acq.osd.mil/dsb/reports/ADA499566.pdf>
- Edwards, V. (1999). Priced-based acquisition: Where in federal contracting? Retrieved from <http://www.wifcon.com/anal/analpricebased.htm>
- Fox, J. R. (1974). *Arming America: How the U.S. buys weapons*. Boston, MA: Harvard Business School, Division of Research.
- Fox, J. R. (1988). *The defense management challenge: Weapons acquisition*. Boston, MA: Harvard Business School.
- Fox, J. R. (2001). *Defense acquisition history symposium keynote address*. Retrieved from [http://www.history.army.mil/html/books/070/70-87-1/CMH\\_Pub\\_70-87-1.pdf](http://www.history.army.mil/html/books/070/70-87-1/CMH_Pub_70-87-1.pdf)

- Fox, J. R. (2003). *A-12 Termination sets harmful precedent for defense programs*. Retrieved from <http://www.nationaldefensemagazine.org/archive/2003/January/Pages/a-123950.aspx>
- Fox, J. R. (2011). *Defense acquisition reform, 1960–2009: An Elusive goal*. Retrieved From <http://www.hbs.edu/research/pdf/11-120.pdf>
- Gansler, J. S. (1982). *The Defense industry* (1st ed.). Cambridge, MA: MIT Press.
- Gansler, J. S. (1989). *Affording defense*. Cambridge, MA: MIT Press.
- Gansler, J. S. (1996). *Defense conversion* (1st ed.). Cambridge, MA: MIT Press.
- Gansler, J. S. (2011). *Democracy's arsenal*. Cambridge, MA: MIT Press.
- Gansler, J. S., Lucyshyn, W., & Arendt, M. (2009). *Competition in defense acquisitions*. Retrieved from <http://www.dtic.mil/dtic/tr/fulltext/u2/a529406.pdf>
- General Accounting Office (GAO). (1980). *F/A-18 Naval strike fighter: Its effectiveness is uncertain* (GAO-PSAD-80-24). Retrieved from <http://www.gao.gov>
- Gholz, E., McKinney, E., & Sapolsky, H. M. (1994, May). *Acquisition reform-lean 94-03*. Retrieved from [http://dspace.mit.edu/bitstream/handle/1721.1/1656/94\\_03.pdf?sequence=1](http://dspace.mit.edu/bitstream/handle/1721.1/1656/94_03.pdf?sequence=1)
- Gordon, J. A. (1994). *Reviewing the national performance review: A critique of reinventing government*. Retrieved from <http://www.issues2000.org/spectrum/npr.htm>
- Government Accountability Office (GAO). (2010a, March). *Joint strike fighter: Additional costs and delays risk not meeting warfighter requirements on time* (GAO-10-382). Retrieved from <http://www.gao.gov/products/GAO-10-382>
- Government Accountability Office (GAO). (2010b, March). *Joint strike fighter: Significant challenges remain as DoD restructures program* (GAO-10-520T). Retrieved from <http://www.gao.gov>
- Hanks, C. (2005). *Reexamining military acquisition reform: Are we there yet?* Retrieved from [www.rand.org/pubs/monographs/2005/RAND\\_MG291.pdf](http://www.rand.org/pubs/monographs/2005/RAND_MG291.pdf)
- Hinnant, F. (1993). *Acquisition reform: Issue revisited*. Retrieved from <http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA276855>

- The History Place (1999). *The Vietnam war: The bitter end 1969–1975*. Retrieved from: <http://www.historyplace.com/unitedstates/vietnam/index-1969.html>
- Leisenring, S. (2004). *Department of defense contracting: Considerations for selecting contract type*. Retrieved from <http://www.dtic.mil/dtic/tr/fulltext/u2/a424344.pdf>
- Lorell, M. A., Lowell, J. F., Kennedy, M., Levoux, H. P. (2000). *Cheaper, faster, better? Commercial approaches to weapons acquisition*. Retrieved from <http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA374434>
- McNaugher, T. L. (1989). *New weapons, old politics: America's military procurement muddle*. Washington, DC: Brookings Institution.
- Michel, J.-B., Shen, Y. K., Aiden, A. P., Veres, A., Gray, M. K, Google Books Team, ... Aiden, E. L. (2011, January 14). *Quantitative analysis of culture using millions of digitized books*. *Science*, 331(6014), 176–182. doi:10.1126/science.1199644
- National Archives (revised 2007). *Statistical information about casualties of the Vietnam war*. Retrieved from: <http://www.archives.gov/research/military/vietnam-war/casualty-statistics.html>
- National Defense Budget Estimates for FY12 (March, 2011) Office of the Under Secretary of Defense (Comptroller). Retrieved from: [comptroller.defense.gov/defbudget/fy2012/FY12\\_Green\\_Book.pdf](http://comptroller.defense.gov/defbudget/fy2012/FY12_Green_Book.pdf)
- Office of Management and Budget (OMB). (2009). *Memorandum for the heads of departments and agencies: Improving government acquisition*. Retrieved from [http://www.whitehouse.gov/omb/assets/memoranda\\_fy2009/m-09-25.pdf](http://www.whitehouse.gov/omb/assets/memoranda_fy2009/m-09-25.pdf)
- Office of Management and Budget (2012). *Historical tables: Budget of the U.S. government fiscal year 2012*. Retrieved from <http://www.whitehouse.gov/sites/default/files/omb/budget/fy2012/assets/hist.pdf>
- Przemieniecki, J. (1993). *Acquisition of defense systems*. Retrieved from [http://books.google.com/books?id=Qclk9W3seDgC&pg=PA15&lpg=PA15&dq=Cost+reimbursement+contract+in+1970s&source=bl&ots=ULumYMeZeW&sig=4xP1Ze\\_E2rJH\\_4OBGNAVLI00yWE&hl=en&ei=fujFTqbIOemwiQL2ocCHBg&sa=X&oi=book\\_result&ct=result&resnum=1&ved=0CB0Q6AEwAA#v=onepage&q=Cost%20reimbursement%20contract%20in%201970s&f=false](http://books.google.com/books?id=Qclk9W3seDgC&pg=PA15&lpg=PA15&dq=Cost+reimbursement+contract+in+1970s&source=bl&ots=ULumYMeZeW&sig=4xP1Ze_E2rJH_4OBGNAVLI00yWE&hl=en&ei=fujFTqbIOemwiQL2ocCHBg&sa=X&oi=book_result&ct=result&resnum=1&ved=0CB0Q6AEwAA#v=onepage&q=Cost%20reimbursement%20contract%20in%201970s&f=false)
- Reeves, S. V. (1996). *The ghosts of acquisition reform: Past, present and future*. Fort McNair, Washington, DC.

- Rice, D. (1979). *Defense resource management study: Final report*. Retrieved from <http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA084735>
- Richey, G. (nd). *F-111 Systems engineering case study*. Retrieved from <https://acc.dau.mil/adl/en-US/37599/file/9104/F-111%20SE%20-%20GK%20Richey.pdf>
- Sacilotto, K. M. (2011). *Déjà vu all over again: Cost-reimbursement contracts fall out of favor again, but should they?* Westlaw, 40 Pub. Cont. L. J. 681. American Bar Association.
- Schwartz, M. (2010). *The Nunn-McCurdy Act: Background, analysis, and issues for Congress*. Retrieved from <http://www.fas.org/sgp/crs/misc/R41293.pdf>
- Shiman, P. (2001). *Defense acquisition history project: An overview of acquisition, 1991 - present*. Retrieved from <http://www.history.army.mil/acquisition/newsletters/acq1-4.html>
- Sondheimer, K. E. (2001, October). *Indirect-cost management guide: Navigating the sea of overhead*. Fort Belvor, VA: Defense Systems Management College Press. Retrieved from [http://www.dau.mil/pubs/gdbks/icm\\_guide.pdf](http://www.dau.mil/pubs/gdbks/icm_guide.pdf)
- Spring, B. (2005). *Congressional restraint is key to successful defense acquisition reform*. Backgrounder. Retrieved from <http://www.heritage.org/research/reports/2005/10/congressional-restraint-is-key-to-successful-defense-acquisition-reform>
- TFX F-111A/B Source Selection (1963). Retrieved from: <http://www.georgespangenberg.com/vf3.htm>
- Tulalip Tribes. (2003). Tulalip veteran: Vietnam war. Retrieved from [http://www.tulalipveterans.org/vietnam\\_era.asp](http://www.tulalipveterans.org/vietnam_era.asp)
- Tyson, K. (1998). *Assessing cost-reduction initiatives in a changing defense acquisition environment: A handbook*. Retrieved from [http://www.google.com/url?sa=t&rct=j&q=acquired%20technically%20sophisticated%20weapon%20systems%20designed%20&source=web&cd=1&ved=0CFE\\_QFjAA&url=http%3A%2F%2Fwww.dtic.mil%2Fcgi-bin%2FGetTRDoc%3FAD%3DADA336265&ei=TKDOT5XoK87k6QHo2qmjDA&usg=AFQjCNGJX63xHGC2znGPQfKlcfM1SafPQ](http://www.google.com/url?sa=t&rct=j&q=acquired%20technically%20sophisticated%20weapon%20systems%20designed%20&source=web&cd=1&ved=0CFE_QFjAA&url=http%3A%2F%2Fwww.dtic.mil%2Fcgi-bin%2FGetTRDoc%3FAD%3DADA336265&ei=TKDOT5XoK87k6QHo2qmjDA&usg=AFQjCNGJX63xHGC2znGPQfKlcfM1SafPQ)

Under Secretary of Defense for Acquisition, Technology, and Logistics (USD[AT&L]). (2010a, June 28). *Better buying power: Mandate for restoring affordability and productivity in defense spending*. Retrieved from [http://www.acq.osd.mil/docs/USD%28AT&L%29\\_Memo\\_to\\_Acquisition\\_Professionals\\_June\\_28\\_2010.pdf](http://www.acq.osd.mil/docs/USD%28AT&L%29_Memo_to_Acquisition_Professionals_June_28_2010.pdf)

Under Secretary of Defense for Acquisition, Technology, & Logistics (USD[AT&L]). (2010b, September 14). *Better buying power: Guidance on obtaining greater efficiency and productivity in defense spending*. Retrieved from [http://www.acq.osd.mil/docs/USD\\_ATL\\_Guidance\\_Memo\\_September\\_14\\_2010\\_FINAL.PDF](http://www.acq.osd.mil/docs/USD_ATL_Guidance_Memo_September_14_2010_FINAL.PDF)

Vietnam War. (2007). In *the Columbia Electronic Encyclopedia* (6<sup>th</sup> ed.). New York, NY: Columbia University Press.

Watts, B. (2008). *The U.S. defense industrial base: Past, present and future*. Retrieved from [http://www.google.com/url?q=http://www.csbaonline.org/wp-content/uploads/2011/02/2008.10.15-Defense-Industrial-Base.pdf&sa=U&ei=djS9T-iiCIOZ6AHnrslY&ved=0CBEQFjAA&usg=AFQjCNFQ21EsxKYsSl\\_t6SfTA3JpleGh0g](http://www.google.com/url?q=http://www.csbaonline.org/wp-content/uploads/2011/02/2008.10.15-Defense-Industrial-Base.pdf&sa=U&ei=djS9T-iiCIOZ6AHnrslY&ved=0CBEQFjAA&usg=AFQjCNFQ21EsxKYsSl_t6SfTA3JpleGh0g)

## INITIAL DISTRIBUTION LIST

1. Defense Technical Information Center  
Ft. Belvoir, Virginia
2. Dudley Knox Library  
Naval Postgraduate School  
Monterey, California