METAMORPHOSIS OF BUSINESS STRATEGIES AND AIR FORCE ACQUISITION POLICIES IN THE AEROSPACE PROPULSION INDUSTRY: CASE STUDY OF THE "GREAT ENGINE WAR"

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ABSTRACT

The Alternate Fighter Engine (AFE) competition, commonly referred to as the "Great Engine War", represents a major benchmark in defense acquisitions; acclaimed by some as the springboard that launched the Department of Defense (DOD) into a new era of procurement policies and practices. The resounding success of the competition, resulting in the unprecedented reversal of the long-standing practice of awarding production contracts exclusively to those successful in capturing the Research and Development contracts is a tribute to the commitment and perseverance of a few in the Air Force and industry that believed strongly that the government and public would benefit in the hosting of such a competition.

The "Great Engine War" will serve as the illustrated case analysis of the competitive strategies of the nation's two leading gas turbine engine manufacturers and of the tactics employed by the Air Force that proved effective in keeping the competition on track. Particular emphasis will be placed on meticulously dissecting each company's competitive strategies in their attempt at capturing the Air Force's business for powering the U.S.'s frontline fighter aircraft. An explanation for the successes and failures of the companies in securing a foothold in this lucrative, estimated to be in excess of $10 billion, market will be undertaken in order to understand the metamorphosis of these business strategies in dealing with its government customers. Also, an examination of how the outcome of this particular competition, in an environment ripe for change, has provided the catalyst for a major reformation of defense acquisitions will be conducted. The views and perceptions of key stakeholders within government and industry will serve as the foundation for this critical critique of the defense acquisition business.

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CHAPTER 1

INTRODUCTION

A. ALTERNATE FIGHTER ENGINE COMPETITION AND THE WEAPON SYSTEM ACQUISITION PROCESS

The Weapon System Acquisition process has been undergoing a major metamorphosis or transformation over the past five years; spurred on by the highly acclaimed and much publicized success of the Alternate Fighter Engine (AFE) competition between General Electric (G.E.) and Pratt & Whitney (P&W). Although critics have advocated reform for nearly three decades, the AFE competition, referred to by many as the "Great Engine War", served as the catalyst that started the "change reaction" which is still ongoing today. The reasons for the success of the AFE competition in reversing the traditional practice of sole-sourcing engine production contracts while also serving to launch the Department of Defense (DOD) into an era of acquisition reform, will be the principle subjects of this case analysis.

As will be discussed, the birth and survival of the unprecedented competition cannot be ascribed to any single event. Rather, the impetus and growth of the competition stemmed from a confluence of factors that included public and Congressional criticisms of the defense acquisition business, negative publicity surrounding the existing fighter engine (F100), G.E.'s commitment to reentering the

fighter engine business, and United Technologies decision to take on their customer and competitor in a fight to the end. Although many strategic battles were fought and won by the various constituents, G.E. and the Air Force clearly emerged victorious in the "war". Even though many factors favored the move toward recompeting the Air Force's large fighter engine base, there were as many forces, i.e., austere budgets, growing skepticism of afterburning turbofan engines, questionable cost effectiveness of recompeting, and the belief that the money could be better spent solving the problems plaguing the F100 engine , working to retard the competitive drive.

Which events or factors contributed the most to getting the competition train rolling and keeping it on track, is a matter subject to the views and perceptions of those who were involved in the process. However, as will be shown in the chapters to follow, the strategies and perseverance of a few key stakeholders did much to ignite and feed the fire that powered the competition train down the tracks.

The AFE competition, like many processes open to public scrutiny and involving high stakes, was not void of the political element. Although it is impossible to conclusively establish the role of politics in the decision that enshrined the competition, it is clear that politics had a pronounced influence in the birth and survival of the "Great Engine War".

A comprehensive analysis of the strategies and tactics employed by the key stakeholders is a prerequisite to understanding the events and decisions that ultimately led to putting G.E. back into the large fighter engine market. As will be described and discussed in the following chapters, much can and should be gleaned directly from the AFE competition when positioning to do future business with the government. In particular, a myriad of insightful and important lessons relative to strategy and structure will be extracted from this analysis of the AFE competition. Contrasting the success and failures of each contractor in their bid to capture or retain the Air Force's fighter engine business, provides a vivid picture of how to, and how not to, succeed in dealing with a powerful customer.

The differences in the approaches employed by the two competitors are striking, with P&W's strategy serving to complement G.E.'s in building an almost irrefutable case for bringing G.E. into the fighter engine business. Some defense analysts actually "credit" UTC/P&W with doing as much to lose the "war" as G.E. did in winning it. The strengths and weaknesses of the different strategies are identified and analyzed in the broader context of doing business with a government customer in today's environment. The transformation or metamorphosis of UTC/P&W's business strategy over the past three years, closely emulating that which proved so successful for G.E., provides testimony to the importance of applying the lessons learned from past failures.

This case analysis of the "Great Engine War" will serve as a window through which to view how the different strategies and decision-making processes within the corporations and government worked together, pushing and pulling, to bring about a major benchmark in propulsion acquisition. Emphasis will be placed on highlighting these differences and describing how they contributed toward the final outcome of rewarding the challenger, G.E., with a major share of the large fighter engine market, stripping away the monopoly previously enjoyed by the incumbent, P&W.

The by-products of the AFE competition, affecting both government and industry, have been many and varied. Some of the more significant changes that have evolved from the competition include the institutionalization of competitive procurements, proliferation of warranties, cost sharing, multiple sourcing, and a plethora of new legislation aimed at "cleaning up" the defense acquisition business. In response to these sweeping changes, industry is having to make changes to its business strategies in order to remain successful in capturing and retaining defense business. It is almost a certainty that this period of change will bring about a reshaping of the defense industrial base. However, one can only speculate as to the form it will take and whether this metamorphic era in defense acquisition will culminate in the birth of a stronger, more efficient and effective system. For now, it appears that industry and the Department of Defense (DOD) will need to weather the new few years in order to see what emerges from the government's legislative concoction of the past five years.

Before launching into the analysis of the AFE competition and the changes which it helped to spawn, it is best to gain an appreciation of the key events and environment that characterize the period embodying the "Great Engine War". Such will be the topics of the next few sections.

B. OVERVIEW OF THE ACQUISITION ENVIRONMENT

The defense procurement process has been under constant fire since the early 1960s. Critics abound from within the Department of Defense (DOD) and industry on the inefficiencies and questionable practices employed by industry and government in securing and managing defense system contracts. Much has been written over the past twenty years on the subject, most notably the accounts by Peck & Scherer,[1] Gansler[2], and Fox[3] which address many of the shortcomings of the process. Fox captures what he perceives to be the essence of the problem in his statement:

> What seldom distinguishes any phase of the acquisition process is a genuine commitment to the most efficient and effective management of resources--people, money, materials, facilities, and time. The current relationships between Congress and the Defense Department, among governmental defense agencies, and between Government and industry, effectively prevent the system from functioning to its best advantage.[4]

Gansler attributes many of the current problems plaguing the defense business to the structure of the acquisition machine, particularly the lack of recognition that the defense system acquisition process is anything but a free market; where cost growth is an accepted part of doing business. His views on the subject are expressed in his statement:

> Clearly, traditional theory of economic behavior in a free market does not apply to the defense industry, and thus many of the actions that have been taken under the assumption that the theory is applicable have not had the desired effects. Today there are very serious economic problems and

> dangerous economic trends in the defense industry. Their combined impact is weakening the military posture of the United States, and has the potential to become even more critical in the years ahead unless significant changes are brought about.[5/]

However, probably the most startling and revealing account of the fraud, waste, and abuse in military procurement is captured by Rasor.[6/] His explicit examples of where the system has failed to work in the best interests of the country provide little comfort to those claiming that the system has been reformed.

In addition to the books by Gansler, Peck & Scherer, Fox, and Rasor, much as been written as an outgrowth of Presidential and Congressional commissions on the subject of the defense acquisition process. Probably the most influencial of these studies which helped mold the acquisition process to that which exists today were the 1972 Government Procurement Commission Report,[7/] Grace Commission Major Proposals for cost control,[8/] Carlucci Initiatives,[9/] and the recent Packard Commission Report[10/]. As will be described in the treatment of the general issues related to defense acquisition, many if not most, of the current recommendations for change that are being advocated by the Packard Commission transcend the past two decades.

A major element of defense system acquisition in which limited competition prevails is the source selection process. Source selection, as defined by the Department of Defense, represents "the process wherein the requirements, facts, recommendations, and

Government policy relevant to an award decision in a competitive procurement of a system are examined and the decision is made."[11/] Simply stated, the objective is to ensure a fair and consistent evaluation of contractor's proposal(s) with the effort culminating in the selection of a proposal(s) that satisfies the procuring service's criteria.

Although often perceived as inflexible, the process and its eventual outcome is subject to the views and "influence" of key governmental stakeholders, most notably the Source Selection Advisory Council(SSAC), Source Selection Authority(SSA), Secretary of Defense(if different than SSA), and Congress. The role or involvement of Congress in the decision-making process takes on different forms depending on the phase or stage of the procurement process. These views or perceptions are in turn influenced by the strategies or approaches employed by competing firms in their attempt to capture the government's business. Liske & Rundquist devote a good deal of attention to this issue, arguing that not only is involvement stage dependent, but that,

> ... the degree and quality of congressional involvement varies across these stages both as a function of the institutional structure of Congress and as a function of the degree to which 1) congressmen are mobilized into playing one or more generally recognized political roles, and 2) the degree to which given policy alternatives require individual congressmen to play roles that are congruent or conflicting.(12)

They also cite that there is anything but unanimity on the nature and extent of policy-makers involvement in the decision process. In fact, early research of the political element in the decision process resulted in the finding that

> The spoor of alleged political influence in weapons acquisition (as for example in source selection decisions) is to be found everywhere. But a fair shot at the beast itself is rare.[13]

The actual competitive selection process, particularly the strategies employed by the key stakeholders, cannot be properly explained by a simple model in which the actions of the different, and often conflicting, interests of the stakeholders is predictable or necessarily rational. Rather, the process is one in which the outcome represents a concatenation of distinctly unique, but interwoven, governmental behavioral models. An analysis of this process requires an *a priori* acceptance that more than one model may be operative at any one time. Allison's[14] work of viewing foreign policy, specifically the Cuban Missile Crisis, as the output of three separate conceptual models (Rational Actor, Organizational, & Political) lends itself nicely to adoption for the purpose of dissecting the events surrounding competitive source selection decisions. However, the decision itself is of little significance without an appreciation and understanding of the factors and events that contributed to the final outcome. Of particular importance and interest is the role that the different competitive business strategies play in influencing and guiding the ultimate award decision. Also, a treatment of the business strategies surrounding a competition would not be complete

without addressing their evolution, attributes, weaknesses, champions, and effectiveness in a rapidly changing acquisition environment. Such will be the major thrust of this study. In order to avoid generalities about the process the analysis will focus on a recent Air Force source selection dealing with the award of production contracts to two major manufacturers of gas turbine engines; upending the long standing practice of sole sourcing engine procurements.

The Alternate Fighter Engine (AFE) competition, better known as the "Great Engine War" is considered by many as the competition of the century; pitting the incumbent P&W against the formidable challenger G.E. Although formally conducted over the course of less than a year the seed that would eventually grow to represent a true turning point in the Air Force's acquisition policy was planted nearly a decade before the decision was made to formally (re)compete the Air Force's fighter engine base. The impact of this unprecedented, highly successful competition on future government acquisition policies and strategies across the defense industry is likely to be quite pronounced. Competition advocates, new legislation mandating competition, and initiatives by the different services, represents only the beginning of changes that have surfaced in the three years since the AFE competition was hailed as a "success story" in the long criticized history of weapon system acquisitions by the U.S. government.

The principal focus of this case analysis is on providing an understanding and effectiveness assessment of the various strategies and decision processes employed by the different stakeholders throughout the AFE competition. This will be accomplished by first providing a comprehensive descriptive analysis of G.E.'s and UTC/P&W's structures and competitive strategies in Chapter 2. After completing these detailed portraits, an analysis will be undertaken in Chapter 3, aimed at describing the different stakeholder's strategies and resulting actions using a conceptual framework that incorporates the three paradigms developed by Allison. It must be recognized, however, that an analysis of any decision process, particularly one as complex as the AFE, may necessitate moving beyond the boundaries defined by Allison's work. As such Allison's paradigms will serve as the base upon which the analysis will build. The analysis will draw heavily upon the views and perceptions of individuals, both industry and government, that were active players in the AFE competition.

In order to avoid having to recapitulate the chronological sequence of events leading up to and surrounding the AFE competition, reference will be made to two comprehensive case studies by Kennedy [15/] and Drewes.[16/] These treatments of the so called "Great Engine War" capture many of the key issues and stakeholders associated with the competition while serving to provide insight into the critical events that determined the path the competition was to follow.

For those who are less inclined to delve into the intricacies provided by these cases, a much abbreviated chronological portrayal of the key events and stakeholders is contained in Figure 1.1 and Table 1.1. This summary is intended to provide the uninformed reader with a general appreciation of the major events surrounding, and salient features of, the "Great Engine War". The information upon which Figure 1.1 and the accompanying table were constructed was drawn from case studies, press releases, personal interviews, interdepartment correspondence, Congressional records, and a myriad of news media on the competition between P&W and G.E.

The major theme of the "war" dealt with G.E.'s success in reentering the large fighter engine market through the reversal of a long-standing procurement practice of retaining the contractor who was initially successful in capturing the development contract. Prior to the Air Force's decision to re-compete the large fighter engine base, P&W had been the exclusive supplier of the gas turbine engines powering the Air Force's F-15 and F-16 fighter aircraft. By the time (February 1984) the Air Force announced its decision to split future purchases of engines between G.E. and P&W, P&W had produced and delivered over 3,000 engines, valued at over $10 billion (1984 $).

The turn of events which provided G.E. the opportunity to position itself in the high-thrust fighter engine market, upending the historical practice of giving all follow-on business to the contractor chosen in the original development competition, will be described in

CHRONOLOGY OF SIGNIFICANT EVENTS SURROUNDING AFE COMPETITION

STAKEHOLDER	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
G.E		3					6				11	15	17 19	27	37	46 47 49 50
UTC/P&W	1 2		4				5				12 14			24 27 25 29 31 32	35 37 41 45	46
CONGRESS									7	9	13		16	21 23 26 22 27	33 36 40 42 45 34 37 43 38	48
DOD														22 28	44	46
AIR FORCE	2	3					5				10 11 13	15	17 19 20	21 23 25 24 26 27 30	33 36 40 43 34 37 39	46 48
NAVY	1								7	9						47
EXECUTIVE OFFICE									8				18			
OTHERS																49 50

Figure 1.1 Chronology of Major Events Surrounding the AFE Competition

Table 1.1 Chronology of Major Events Surrounding AFE Competition

EVENT--DATE	STAKEHOLDERS	SYNOPSIS OF MAJOR EVENTS
1--January 1969	P&W and Navy	P&W is awarded the Navy's contract to provide the engine(TF30) for the F-14 fighter.
2--December 1969	P&W and Air Force	P&W receives contract to provide engine(F100) for F-15 fighter.
3--May 1970	G.E. & Air Force	G.E. is awarded contract to provide engine(F101) for B-1 bomber.
4--September 1971	United Tech. Corp	Harry Gray is hired in at UTC as Chief Executive Officer(CEO)
5--January 1975	P&W and Air Force	P&W receives contract to provide engine(F100) for F-16 fighter.
6--July 1975	G.E.	G.E. initiates F101X (fighter derivative) engine demonstration program.
7--June 1977	Executive Office	President Carter cancels B-1 program.
8--October 1977	Congress & Navy	Congress appropriates $15M for initiation of F-14 reengining development program.
9--October 1978	Congress & Navy	Congress adds $26M to existing $15M for reengining effort.
10--February 1979	Congress & Air Force	General Lew Allen, A.F. Chief of Staff, provides testimony to the House Appropriations Committee on behalf of the A.F.'s desire to fund the F101 DFE development, thereby introducing competition into the fighter engine market.
11--March 1979	Congress, A.F., & G.E.	$33M of the $41M originally appropriated for Navy's reengining effort redirected to A.F. for development of F101 DFE under EMDP.
12--April 1979	P&W	P&W plagued by two major vendor strikes---F100 production suffers.
13--November 1979	Congress & A.F.	General Alton Slay, AFSC Commander, testifies to Senate Armed Services Committee(SASC) on F100 problems(strikes, durability, operability, & spare part costs), closing with an endorsement for developing the F101 DFE so as to introduce competition and provide an alternative if the Air Force decides they need it.
14--December 1979	P&W	Harry Gray hires Robert Carlson into UTC as President of P&W.
15--January 1980	G.E. & Air Force	$30M authorized to continue development of F101 DFE.
16--December 1980	Congress	Congressman Addabbo, Chairman of the House Defense Appropriations Subcommittee, tries unsucessfully to redistributed funds airmarked for G.E.'s F101 DFE development effort, to P&W.

Table 1.1 Chronology of Major Events Surrounding AFE Competition (continued)

EVENT--DATE	STAKEHOLDERS	SYNOPSIS OF MAJOR EVENTS
17--January 1981	G.E. & Air Force	$52M authorized to continue development effort of F101 DFE.
18--February 1981	Executive Office	President Reagan resurrects B-1 program.
19--August 1981	Air Force	Request for Information(RFI) issued requesting information for use in assessing potential benefits of hosting competition.
20--December 1981	G.E. & Air Force	$35M authorized to continue development of F101 DFE.
21--January 1982	Congress & A.F.	Lt. General Burke, A.F. Deputy Chief of Staff(DCS), sends letter to Congressman Addabbo, Chairman of House Subcommittee on Defense Appropriations announcing Air Force's intentions of hosting a formal competition between G.E. and P&W for fighter engines.
22--January 1982	DOD & Congress	Frank Carlucci, Deputy Secretary of Defense, sends a letter to Senator Cohen(Maine) stressing importance of getting F101 DFE engine qualified so that competition can exist in fighter engines.
23--March 1982	Congress & A.F.	Lt. General Burke sends letters to House and Senate Armed Services and Defense Appropriations Committee/Subcommittee chairmen reiterating A.F.'s plans for "pusturing for competitive acquisitions".
24--April 1982	P&W and Air Force	Robert Carlson, P&W's President sends a letter to General Allen expressing concern relative to A.F.'s plans to compete fighter engine business. He encourages Allen to reconsider his decision on basis of economic issues and thrust disparity.
25--May 1982	P&W and Air Force	General Allen answers Carlson's letter restating Air Force's intentions of competing.
26--May 1982	Congress & A.F.	Congressman Moffett (CT) and Congresswoman Kennelly (CT) send letter to Air Force Secretary Verne Orr stating concerns about damage to P&W if competition proceeds.
27--May 1982	Congress, A.F. G.E. & P&W	Senate Subcommittee on Defense Appropriation holds hearing on AFE competition. Jim Krebs, G.E.'s General Manager for Military Engines, Robert Carlson, P&W's President, and General Kelly Burke, Air Force DCS give testimony advocating (A.F. & G.E.) and condeming (P&W) Air Force's plans to hold competition.
28--September 1982	DOD	Caspar Weinberger sends letter to all military departments stressing importance of pursuing competitive procurements in defense acquisitions.

Table 1.1 Chronology of Major Events Surrounding AFE Competition (continued)

EVENT--DATE	STAKEHOLDERS	SYNOPSIS OF MAJOR EVENTS
29--September 1982	P&W	P&W takes presentation attacking G.E.'s engine and A.F.'s plans to compete to Washington D.C.
30--December 1982	Air Force	Air Force issues draft RFP for AFE Competition
31--December 1982	P&W	P&W submits unsolicited offer to Air Force for a one-time good deal on approximately 2300 F100 engines.
32--January 1983	UTC/P&W	Harry Gray sends letter to Defense Secretary Caspar Weinberger encouraging him to consider P&W's offer thereby deferring competition until derivative fighter aircraft are introduced.
33--March 1983	Congress & A.F.	Congresswoman Barbara Kennelly sends letter to A.F. Secretary Orr asking for bases upon which A.F. rejected P&W's unsolicited proposal.
34--March 1983	Congress & A.F.	Flurry of congressional inquiries directed at A.F. requesting justification for competing P&W against G.E.
35--Marhc 1983	P&W	Robert Carlson, P&W President, comments to reporter during interview that "they (Air Force) can't afford to play games with us" underscoring their (P&W's) strategy of "attack".
36--April 1983	Congress & A.F.	Senator Dodd (CT) sends letter to Secretary Orr expressing concerns about impact to P&W in the case of a split award. "In the event P&W was to lose a substantial portion of the F-15 and F-16 engines by the end of the decade P&W would well cease to be a viable competitor in the military engine business."
37--April 1983	Congress, A.F., G.E. & P&W	House Armed Services Subcommittee on R&D holds hearing on AFE competition. F. McAbee, President P&W GPD, presents economic and readiness arguments for not proceeding with competition. Jim Krebs, G.E. and Asst. Secretary Thomas Cooper present arguments for proceeding as planned.
38--May 1983	Congress	HASC recommends deleting funding for AFE.
39--May 1983	Air Force	Air Force issues formal RFP for AFE competition.
40--July 1983	Congress & A.F.	A Survey and Investigations Staff report, prepared at the request of Congressman Addabbo recommends putting a stop to the competition on the grounds that it won't provide more durable engines or broaden the U.S. base of large fighter engine markets while wasting hundreds of millions of dollars.

Table 1.1 Chronology of Major Events Surrounding AFE Competition (continued)

EVENT--DATE	STAKEHOLDERS	SYNOPSIS OF MAJOR EVENTS
41--August 1983	UTC	Harry Gray takes out full page advertisement in WSJ entitled "Don't Be Sorry You Said It" stressing the importance of saying what you mean rather than blurting out something that you may later regret.
42--September 1983	Congress	Senators Weicker & Chiles propose bill to withhold funds for advance release of production funds for AFE.
43--September 1983	Congrss & A.F.	A.F. Secretary Orr sends letter to Congressman Addabbo addressing issues raised by Survey & Investigation Staff report while restating A.F. intent to proceed with competition.
44--September 1983	DOD	Adm. Isham Linder, Director of Defense for Test & Evaluation, sends letter to leading OSD and Air Force personnel recommending that A.F. delay competition until P&W's engines are completely qualified, slated for late summer 1984.
45--October 1983	UTC & Congress	Harry Gray sends letter to Senator Stevens supporting bill proposed by Weicker & Chiles.
46--February 1984	Air Force, DOD, G.E. & P&W	A.F. Secretary Orr with Defense Secretary Caspar Weinberger's concurrence announces Source Selection award giving G.E. a 75% (120 engines) and P&W 25% (40 engines) share of the FY 85's production contract.
47--February 1984	Navy	Three days after the A.F. announcement Navy Secretary John Lehman announces Navy's plan to put G.E.'s engine into future F-14 purchases.
48--April 1984	Congress & A.F.	Government Comptroller General (GAO) gives "clean bill of health" to A.F. conduct of Source Selection and resulting decision by Secretary Orr.
49--June 1984	Israel	Israel announces its decision to purchase G.E.'s F110 engine for incorporation in future deliveries of F-16 aircraft.
50--July 1984	Turkey	Turkey announces plans to procure F110 engine for its F-16s.

subsequent sections. The birth, survival, and success of the Air Force's decision to re-compete their fighter engine base cannot be attributed to any one single event or person but rather must be viewed as the product of a well-orchestrated chain of events, where the strength and commitment of a few contributed much to the composition and execution of the award winning strategies in an environment ripe for change.

An observer on the periphery of the "war" zone might attempt to explain the outcome as the natural result of a free market system in which the challenger (G.E.) succeeded in beating out the incumbent (P&W) by providing a product whose "value added" to his government customer exceeded that which was being supplied. Although purporting to explain the outcome, it provides little insight into how it came to pass in an environment ascribed by many as anything but a free-market system and not recognized for adhering to a value maximizing process in its selection of contractors. Only with an in-depth look at the environment, strategies, and players can one begin to understand the reasons for the survival and apparent success of the AFE competition. Although thorough in their treatment of what happened to spawn the competition as well as the impetus and motivation for its survival, past studies provide little explanation or discussion of why certain strategies were employed by the two competing contractors, or how these strategies contributed to the eventual reversal of a long standing practice of sole sourcing engine contracts.

Only with the aid of 20/20 hindsight can we begin to understand the reasons for, and ramifications of, the different business strategies employed in the AFE competition. Therefore, an analysis of industry's and government's views of why this competition followed a course that eventually led to a major benchmark in engine acquisition practice is worthy of pursuit.

As an adjunct to the postmortem autopsy of this unprecedented competition, a general treatment of the acquisition business will be undertaken in the concluding section to this case study. As with the AFE competition the analysis of the acquisition process will be developed from information obtained from interviews with industry and government personnel that are active in the defense acquisition business. The study will concentrate on the evolution of DOD acquisition policies and practices with particular emphasis placed on assessing where the defense industry is headed in light of the changes that are being implemented or proposed for overhauling the acquisition process. As with any analysis of this type the views of the individuals upon which the study will be based tend to be subjective in nature. Thus, an attempt will be made to integrate the salient points expressed by the different sources into an objective assessment of the process.

Given the nature and extent of changes being advocated and instituted in the field of defense acquisition, the treatment of this subject will begin with a brief historical overview of the acquisition

business and its evolution over the past 20 years. With the historical perspective as a backdrop, attention will be directed to analyzing some of the actual or anticipated impacts of changes stemming from the recent Carlucci Initiatives and Packard Commission Report. Emphasis will be placed on assessing the near and long term effects of the current administration's policies on defense procurement and acquisition from the perspective of some of those involved in the propulsion business; most notably, the Air Force, DOD, General Electric and United Technologies. Finally, a set of conclusions relative to current defense acquisition policies that reflect the sanitized sentiments of those close to the business will be presented.

C. COMPETITIVE SELECTION PROCESS

Before attempting to analyze the AFE competition using Allison's conceptual frameworks, it is important to understand what the competitive procurement process entails, the key stakeholders, and how it is "designed" to function. As will become apparent upon analyzing the AFE competition, the survival and eventual outcome were the direct result of the strong perseverance and commitment on the part of certain key organizations and stakeholders.

Competitive procurement has long been touted as the key to the salvation of the defense acquisition process. Advocates ascribing this view argue that sustaining competition well into the development and, whenever possible, into the production phase will provide the maximum return on the government's total investment. However, as Peck and Scherer reported

> In general, it would appear that major subsystem contractors are selected through formal competitions even less frequently than weapon system contractors. Especially in the aircraft engine field, new programs have typically been started with the noncompetitive award of a development contract. Although the engines developed under these contracts have generally faced competition from similar engines under development by other firms, there was usually an assumption that an engine would be produced if its development were successful, and by our definition no formal source selection competition occurred.[17]

A major reason given for the survival of the more traditional approach of single contract award early in the development cycle stems

from the perceived notion that "costs to the Government of prolonging competition is prohibitive".[18] In fact, Peck and Scherer go on to say:

> The growing magnitude of these costs has led the armed services gradually to shift their source selection competitions into earlier, and hence lower cost, stages of the weapons cycle, moving first away from prototype competitions and then from design competitions toward what we have called the management competition.[19]

This prevailing sentiment among government policy makers about the DOD acquisition process was captured in a MIT Masters thesis by Air Force Major John Jacob Mahoney where he stated:

> One thing that must be kept in mind is that the nation cannot afford developing two or more weapons with almost identical performance characteristics and mission but with different design approaches.[20]

Numerous reports and studies on DOD acquisition practices performed since the account by Peck and Scherer have emphasized the need for moving back towards active competition in virtually every phase of the acquisition process. A Government Accounting Organization (GAO) report to Congress recommended the pursuit of an acquisition strategy termed Parallel Undocumented Development, stating that "sustaining the competition provides valuable insurance."[21] The investigators further concluded that "lifetime costs--many times development cost or even production cost--will often justify sustaining multiple competitive approaches until there is real assurance that the weapon will perform its assigned mission."[22]

Similarly, a Defense Science Board report[23] on ways in which to reduce the cost of acquiring defense systems recommended "That competitive procurement of hardware be extended as long as possible, and to the greatest extent applicable to systems, subsystems, and components procurement." Gansler echoed this common theme for maintaining the competitive fervor through the production phase in his proposed solution to the ills facing the acquisition process in stating that:

> ... by keeping competition going into the production phase-not just in the early phases of development--the DOD could place greater emphasis on produc on cost reductions.[24]

Finally, the recommendation put forth in the recent Blue Ribbon Commission Report to the President on Defense Acquisition emphasized, once again, the need for reform particularly in the area of sustained competition in the acquisition of weapon systems with a move towards a commercial-style competition that is more aligned with a free market concept. In particular, among the proposed changes aimed at making the system more responsive and efficient was the recommendation to:

> Recodify federal laws governing acquisition in a single, consistent, and greatly simplified procurement statute; and remove those features of current law and regulation that are at variance with the expanded acquisition of commercial products and the establishment of effective commercial-style procurement competition.[25]

The report goes on to further recommend amending the DOD supplement to the Federal Acquisition Regulation to include

establishing "commercial-style competitive procurement practices to the full extent permitted by law."[26/].

Taking competitive procurement as an "accepted means to an end", it is necessary to turn attention to the actual process, i.e., Source Selection, used in selecting the supply source(s) for DOD acquisitions. The process is composed of many stages spanning the issuance of Request for Proposal (RFP) to contract award. In instances where insufficient information is available to assess the feasibility of embarking on a particular program, a Request for Information (RFI) may be issued. The RFI will solicit specific information from prospective contractors without binding commitments on either the contractor or government agency. However, an RFP is typically a quite complex formal document that contains stated performance and design requirements while also containing a list of other information(costs, schedules, production rates, quality plans, logistic requirements, management structure, experience, etc) that must accompany the contractors proposal. Issuance of a RFP signifies that the procuring service is intent on executing the program.

The actual competitive selection process, Figure 1.2, contains a simplified flow diagram that details each major stage of the acquisition process and key stakeholders. The relative involvement of the different stakeholders is stage dependent and varies according to the nature(research, design, demonstration, development, or production) of the contract being competed. Figure 1.3[27/] provides a detailed

COMPETITIVE SELECTION PROCESS

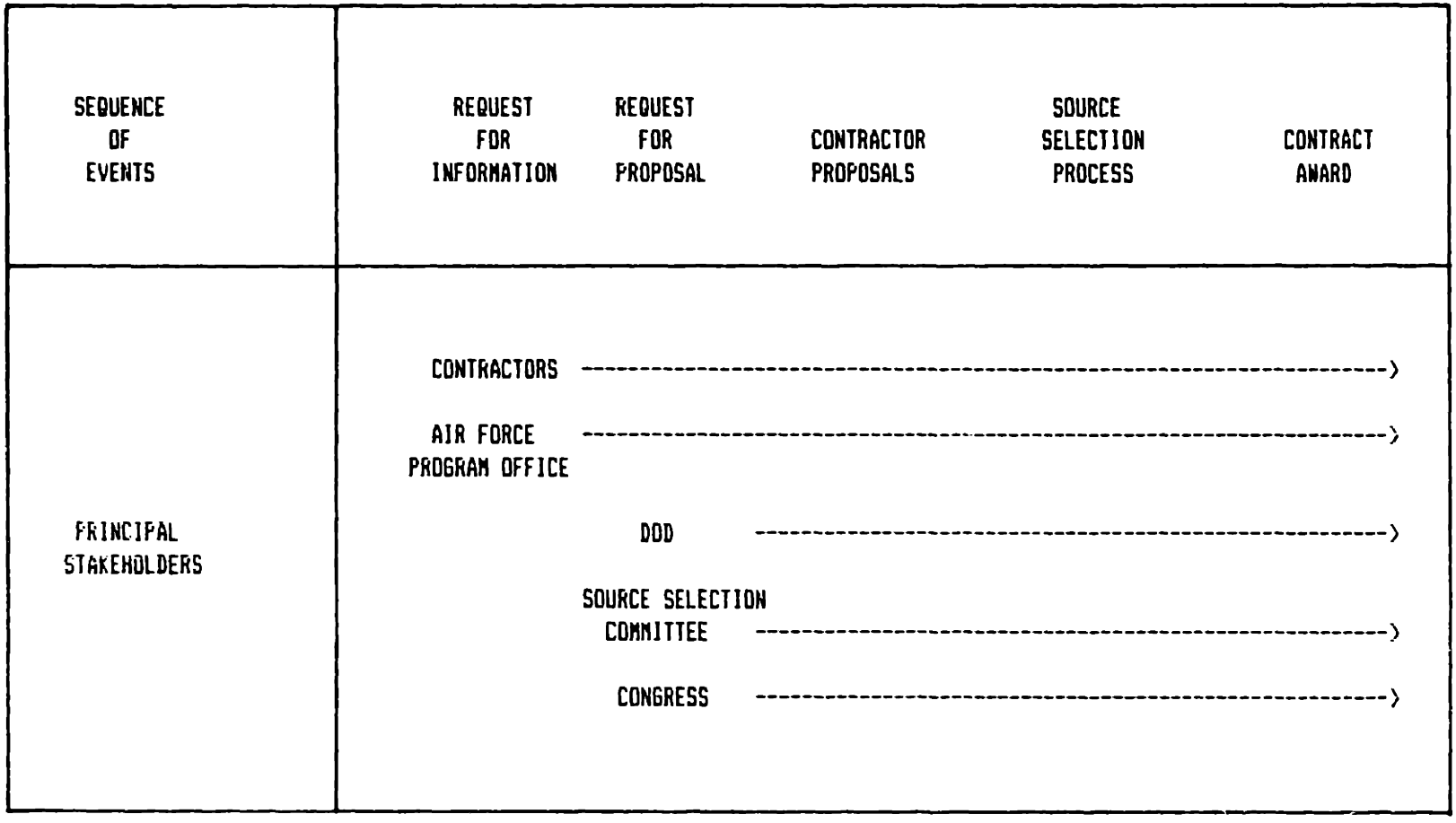
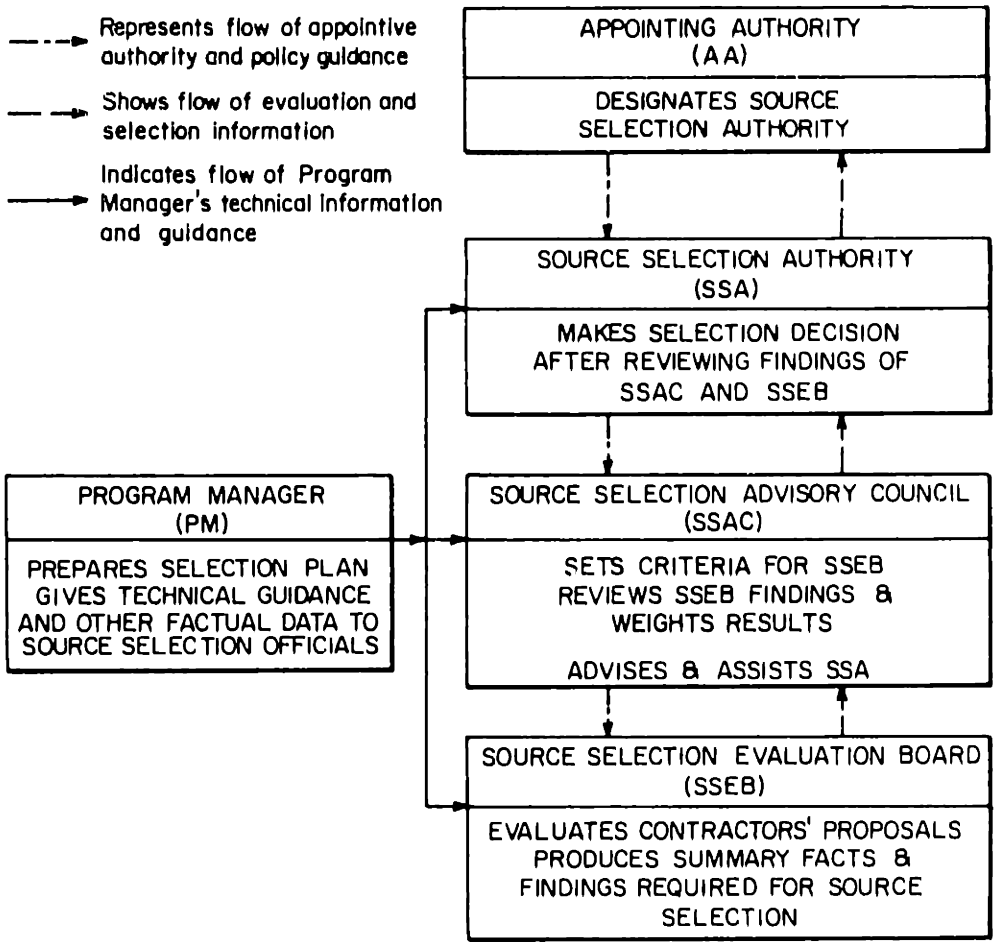


Figure 1.2. Competitive Selection Process Flow Diagram

Figure 1.3. Formal Source Selection Groups



breakdown of the Source Selection constituents and how they interact with one another.

Representatives assigned to each of these committees are normally selected from the functional organizations involved with procuring and supporting the particular weapon system under consideration. The Appointing Authority(AA), normally the Office of the Secretary of Defense, is responsible for appointing the Source Selection Authority. Excepting the rare instances in which the Secretary of Defense performs this function, the job is delegated to the Secretary of the service acquiring the system. His principal roles include appointing the Source Selection Advisory Council(SSAC) and selection of the winning contractor(s). The SSAC and SSEB are the primary players in the actual evaluation. They work together in formulating the methodology, criteria, and corresponding weight factors for use in evaluating the proposals. Finally, although the SSA is responsible for the ultimate decision, he relies heavily on the analysis and recommendations put forth by the SSAC. The significance of this latter point will become apparent when analyzing the AFE competition.

CHAPTER 2

ALTERNATE FIGHTER ENGINE COMPETITION

A. EVOLUTION OF COMPETITION

Much has been written on the events preceding the decision to host the AFE competition, yet as stated by Dr. Thomas Cooper, U.S. Air Force Assistant Secretary, "They don't capture it all."[1/] Case studies of the "Great Engine War" by Kennedy[2/] and Drewes[3/] describe the events and people that were instrumental in bringing about the competition. Drewes captures these key, explicit issues in his statement, "The accumulation of F100 problems, Pratt attitudes, and the strikes gelled a united commitment to bring along the G.E. engine."[4/] One is left with the impression that the outcome (decision to hold the competition) was inevitable, given the nature and extent of circumstances surrounding the Air Force's dealings with its existing contractor.

However, public and Congressional criticisms of the defense acquisition business, particularly the non-free market aspects, G.E.'s commitment to reentering the fighter engine business, and UTC/P&W's decision to mount a fierce counteroffensive against G.E.'s engine in the period preceding the formal competition were as important in building the momentum and support for the competition as those alluded

to by Drewes and Kennedy. Dr. Cooper viewed that much of the impetus on the Hill for moving ahead with the competition was a direct result of what he referred to as,

> .... a grave tactical error by Pratt & Whitney. Rather than supporting their own product, they chose to launch a counteroffensive to kill the G.E. engine. They didn't realize that the rules of engagement on the Hill in lobbying is that you don't run down the other guy's product. P&W's two to three year effort to kill G.E.'s engine got the attention of alot of people on the Hill."[5]

UTC/P&W's political approach at lobbying backfired. Their undaunted efforts to kill their competitor's product actually served to provide support within Congress for carrying the G.E. engine along. Cooper viewed their error as a misreading of the tea leaves on using the political approach for generating support. In retrospect, even their competitor believes that,

> Pratt & Whitney could have stopped the competition had they just come in and said we know we're in trouble and we're going to fix the problems and we need six months to do it."[6]

However, the then President of Pratt & Whitney's Government Products Division (GPD), Frank McAbee, sums up the situation as:

> Clearly our mistake was that we were overconfident that we could sell our concept and ideas to the military by getting support on the Hill. It failed because, (a) it was an erroneous assumption, and (b) we didn't garner the support...it just wasn't there.[7]

Another individual close to the battle during P&W's aggressive attack on both their competitor and the Air Force, William Missimer,

P&W GPD's Executive V.P. under McAbee, remembers their early approach as an effort to:

> ...try and get Congress to tell the Air Force to stop the competition. However, a lot of people down in the trenches at P&W felt that you couldn't win in going against your best customer, and that strategically, it was not a very viable thing to do. Our foxhole mentality of interpreting things said by the Air Force about the G.E. engine as pro G.E. and not being factual or real world, caused alot of bitterness and disappointment, and we found ourselves solidly pitted against the Air Force for over two years.(8)

As to G.E.'s drive to reenter the fighter engine business, George Ward, G.E.'s V.P. and General Manager for Government Products and Program Division, recalled that,

> We realized that without a fighter engine base you were in difficulty. Our loss in the awarding of the F-14 Navy Fighter and F-15 Air Force Fighter contracts were big, but when the Air Force chose the F-16, it hurt significantly.[9]

However, the desire alone was not sufficient to justify launching a fighter engine development program. It was a confluence of many events which eventually led G.E. to take the risk of making an investment to begin a demonstrator engine program. Once initiated, the decision to continue the effort beyond the early experimental phase was an outgrowth of the success achieved in the demonstration program and the environment into which G.E. found themselves being propelled.

We were faced with a unique situation in that:

1) Market had expanded

2) The existing fighter engine contractor was having problems with his products, particularly the TF30

3) The Navy cancelled Pratt & Whitney's derivative engine, F401, slated as a replacement for the underpowered TF30.[11]

Brian Rowe, G.E.'s Senior V.P. & Group Executive for the Aircraft Engine Business Group (AEBG), attributes their decision to press forward as a fallout of President Carter's cancellation of the B-1 program in June 1977, leaving the F101 engine production program high and dry coupled with the problems being experienced by Pratt and Whitney.

> When the B-1 got cancelled, we were committed to building a commercial version, CFM-56, of the F101 at a price and were counting on using the F101 learning curve to get the price down. We had to find something militarily to do with this engine... We got the idea after seeing the troubles P&W was having. Had P&W had a successful program, we probably would never have started it.[10]

Although committed to executing a demonstrator program, G.E. management never really gave serious thought to the possibility that their engine would someday come to replace the F100 in the Air Force's existing fighter base. They aimed the program at the Navy as a replacement for the problem plagued TF30, particularly since Congress had appropriated money for getting a backup engine.

Their vehicle for selling the follow-on development program to the services was as an insurance policy. In fact, Dr. Thomas Cooper, Assistant Secretary of the Air Force, recalls that,

> ... the whole reason there is an Alternate Fighter Engine today had little to do with Air Force requirements... The initial impetus for the competition really had nothing to do with competition at all, but rather Congress, particularly the House Appropriations Committee (HAC), got interested because of the problems the Navy was having with the TF30. They added money to the budget to start a reengine program for the F-14.[12].

According to Cooper,

> It wasn't the Air Force or the Navy that started it, but rather Capitol Hill that started it...Congressman Bill Whitehurst (Virginia) sponsored amendments on the Research and Development subcommittee of the House Armed Services Committee (HASC) to add money to support bringing an alternate engine along.[13]

The Navy's continued reluctance to seize command of the alternate engine development, principally driven by the staggering projections of the retrofit cost, coupled with the Air Force's difficulties with both P&W's F100 engine and UTC/P&W's management, provided the opportunity for G.E. to make headway in selling their program to Congress and the Air Force. Cooper categorized the Air Force's situation in 1978 with Pratt & Whitney as, "a sorry state of affairs where the U.S. Air Force, as the customer, couldn't get the top management to talk about its problems."[14]

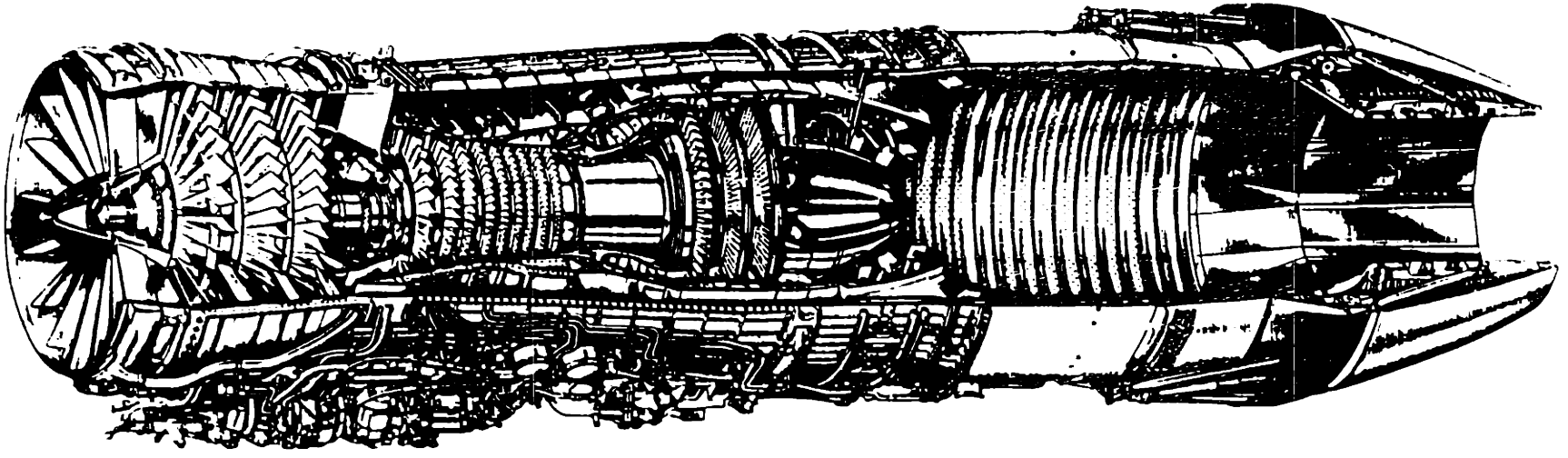
Meanwhile, G.E. was lobbying hard to get budget funding support for furthering the development of their alternate fighter engine (see

Figure 2.1), which had been derived from their existing F404 engine's low pressure system and the F101 high pressure system. The Air Force succeeded, under the leadership of General Alton Slay, AFSC Commander, in getting $82.5 million appropriated to continue the limited development effort on G.E.'s fighter engine candidate, while redesignating it from the F101X to the F101 Derivative Fighter Engine (DFE). The government sponsored development represented a continuation of that which had begun in 1979 when Congress reprogrammed $33 million of $41 million that had previously been appropriated in 1976-77 for the Navy to begin development of an alternative engine for their Tomcat fighter, F-14. Slay's testimony to the Senate Armed Services Committee in November 1979 did much to gain support for continuing the limited development program on the F101 DFE.

> We think it is important to maintain a competitive environment in our aircraft engine industry. Competition is the only way we will get the best efforts from both contractors and vendors. Competition will also provide alternative solutions to the serious technical and support problems we find we now have... To this end, I have pushed, and will continue to push, the development of the F101 DFE.[15]

The program was housed under the Air Force's Engine Model Derivative Program (EMDP) budget line after G.E.'s successful drive in getting the restrictions lifted on EMDP that related to the criteria on which an engine could be classified as a derivative. The original effort was championed by Congressman Bill Dickinson with the strong support/encouragement of General Slay and key House Armed Services Committee staffers, Tony Battista and Thomas Cooper. From that point

F110 AUGMENTED TURBOFAN



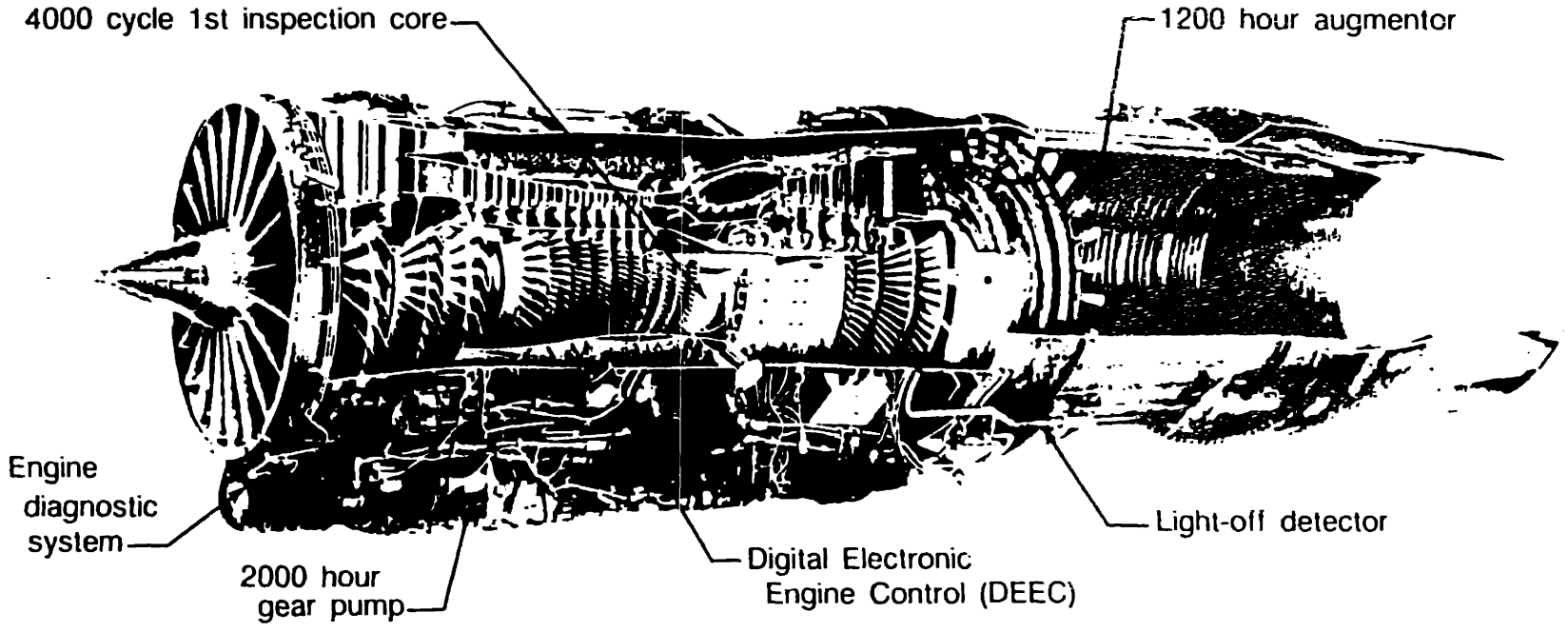
Length	181.9 in.	Bypass ratio	0.87
Max diameter	46.5 in.	Temperature class	2600° F
Airflow	254/270 PPS	Thrust class	27,000 lbs
Pressure ratio	30.4	Weight	3895 lbs

Figure 2.1 G.E.'s AFE Candidate --- F110-GE-100

on, the program gained momentum as a viable threat to P&W's future fighter engine business base. There would be many obstacles for the program to overcome as the engine moved from EMDP to Transition into Engineering Development(TED) and finally into Full Scale Development (FSD); ultimately culminating in a head-to-head competition with P&W's F100-PW-220 (Figure 2.2). However, the Air Force was convinced that they were on the right track.

As to which events or forces contributed the most to keeping the competition train from jumping tracks is a matter subject to the views and perceptions of those involved in the struggle. Ward believes that, "politics played a major role in keeping the competitive threat alive. It could have died a number of times, but some event would always come along to keep it going."[16/] Others argue that it was the perseverance and commitment of key Air Force individuals, most notably Dr. Thomas Cooper, General Abrahamson, General Alton Slay, Air Force Secretary Verne Orr, and General Lawrence Skantze, that contributed the most to the survival of the competition under the constant onslaught by UTC/P&W and their Congressional supporters. Finally, some say it was UTC's upper management that actually, through their arrogant recalcitrant behavior in dealing with their customer, did more to foster support and growth of the competition than any other single factor. The record is clear that senior management at United Technologies Corporation (UTC) and their Pratt & Whitney (P&W) division, particularly Harry Gray and Robert Carlson, were unwilling to accept the situation for what it was and chose to take on their

F100-PW-220 TURBOFAN ENGINE



Airflow	228 lb/sec	Turbine inlet temp	2450°F
Overall pressure ratio	25 to 1	Thrust	23,830 lb
Bypass ratio	0.6	Weight	3218 lb

Figure 2.2 P&W's AFE Candidate -- F100-PW-220

customer rather than acquiescing through adoption of a strategy that could have maximized their chances of winning the competition. This decision, which ran contrary to the advice and recommendations of many senior P&W managers who had worked closely with the Air Force, doomed UTC/P&W to failure. J. O'Connor, their Senior Vice President in charge of the F100 engine program, commented that, "We really didn't have an overall strategy...Gray and Carlson just didn't know the business, yet they were calling the shots."[17/] Others who played active roles in UTC/P&W's "fight for survival" contended that a strategy did exist and was being followed, but that it was either wrong or entirely inflexible in nature. In retrospect, whether their was a strategy or not appears incidental to the fact that the fundamental approach was flawed from the beginning and that Gray and Carlson, working as a team, chose to shun their senior management who were advocating a defensive, rather than offensive, assault on their customer. As history has shown, this was a strategic error that would haunt them for years to come.

B. COMPETITIVE STRATEGIES AND STRUCTURES

Many view the outcome of the Great Engine War as a classic case of where the overconfident, arrogant incumbent did more to lose the competition than did the challenger in winning. A cursory review of the structure and strategies (see Table 2.1) employed by both competitors would tend to support this view, whereas a closer look might suggest otherwise. Surely P&W's strategy of attacking the very concept of competition on the grounds that it wasn't cost effective was misdirected. However, it is fair to question whether the competition would have survived in the face of criticism by certain Congressional members had it not been for the early success of G.E. in developing and demonstrating an engine that appeared to have tackled many, if not all, of the F100 weaknesses. It is difficult to argue against competition when the stakes and likely outcomes are known. However, the circumstances surrounding the decision to bring G.E. into the fighter engine business in a period of austere budgets, growing skepticism of afterburning turbofan engines, and the belief by many that the money required to support G.E.'s development efforts could be better spent solving F100 problems, served to create an atmosphere where furthering the concept of competition was akin to "betting on the come" in a game of craps.

G.E.'s success in demonstrating, through ground and flight testing, that the problems afflicting their competitor's product could be solved, is viewed as the turning point that captured the interest

Table 2.1. Structure & Strategies of AFE Contractors

	Pratt & Whitney	General Electric
STRUCTURE		
Organization	Hierarchical	Hierarchical
Human resources	Senior management intransigent & rigid --gave little weight to views/recommendations of those close to customer and business. --risk averse	Senior management responsive & flexible --listened to program managers and those familiar with the business. --risk prone
Decision unit	Corporate Office (centralized)	Project Office (decentralized)
Decision process	Top Down --little autonomy	Bottom Up --high degree of autonomy
STRATEGY		
Competitive apph	Cost focus	Differentiation & cost focus
Marketing apph	Offensive --degraded competitor's product. --attacked notion of competition.	Defense --built up own product. --endorsed competition.
Positioning apph	Retain 100% share of target market.	>30% share of existing market with multiple products in different target markets.
Proposal apph	"All or Nothing"	Attractive for any split.
Customer relations	Indirect --worked through others to exert pressure/influence on customer.	Direct --made contact with customer at all levels.

and support of those who, in the end, would be credited with either championing or promoting the competition. However, as Drewes cites about the beliefs of even the most stalwart supporters for developing an alternate to the F100,

> Although funding the development of the F101X would prompt better responsiveness and performance by Pratt, no one seriously entertained the notion of actually competing Pratt against G.E. for future requirements."[18].

Then why did the competition survive, particularly when signs of a more responsive P&W were evident well in advance of the decision to host a formal competition? Was the decision to bring G.E. into the fighter engine business preordained? Did the Air Force have a hidden agenda for proceeding with the competition? Did both contractors have sound competitive strategies, and what role did these play in the growth and eventual outcome of the "Great Engine War"? What changes in structures and strategies has the AFE competition spawned? Such will be the subjects of the next three sections. Drewes' comprehensive treatment of the key events and views of government officials during the period serves to provide some insight into why the Air Force "reacted" in a manner that drew support for moving forward with the competition. As to what each contractor was doing to make their views known and how their different strategies influenced the outcome, will be explored in the succeeding sections.

B.1 General Electric's Competitive Approach

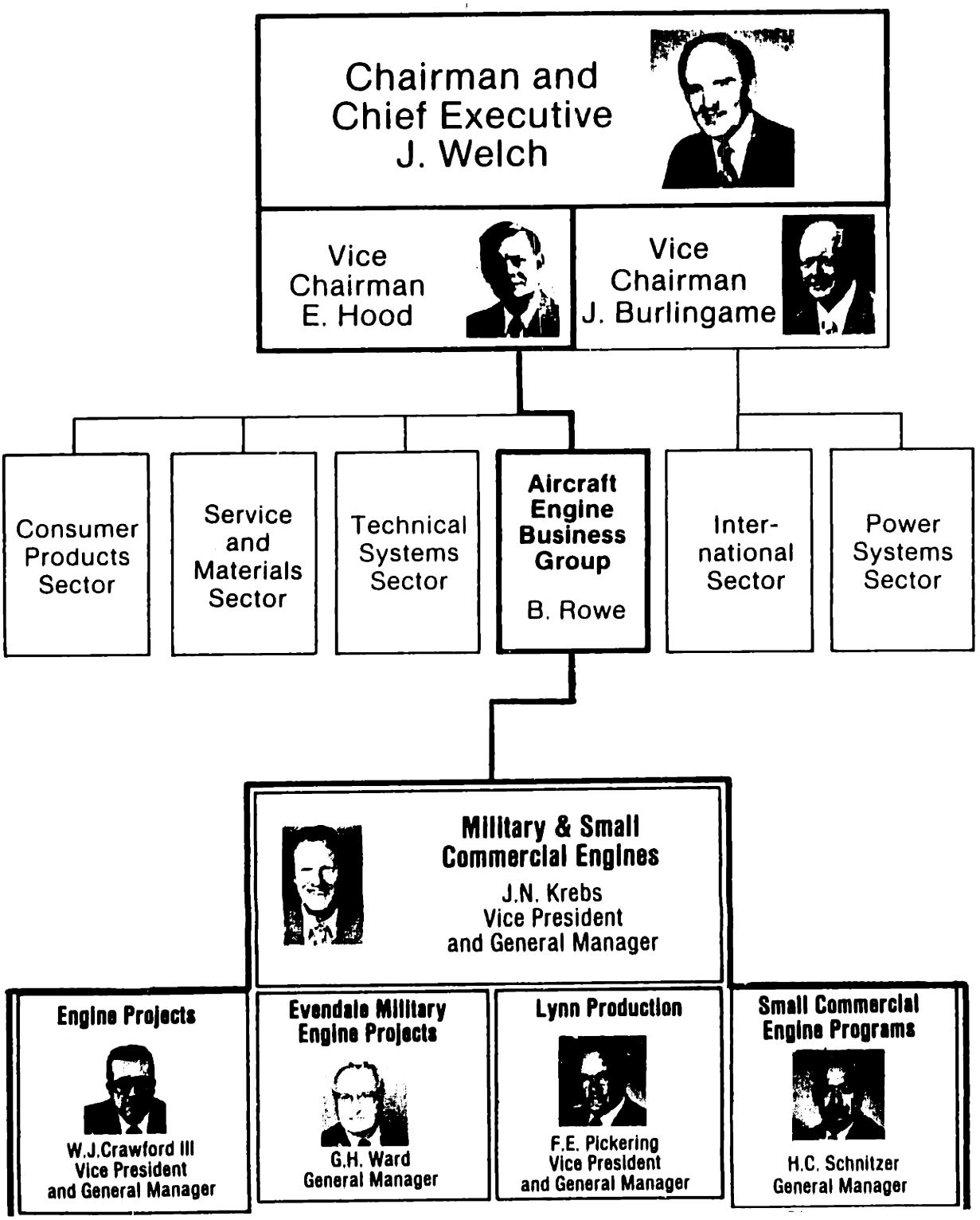
General Electric (GE) began its first efforts to use turbine power in 1897 when they employed Charles G. Curtis and put him to work developing a turbine aimed at generating electricity.[19] However, it wasn't until 1942 that G.E. entered the jet age, when it put the first jet engine, designated the G.E. I-A, ever to be run in the United States, to test on April 18, 1942. The 45-year interlude had been spent designing, developing, and building turbochargers or boosters. In fact, G.E. won its first, of what would be many, military aviation competitions in the fall of 1918 with a supercharged engine designed for the Army. Much to their chagrin, the program was terminated along with all military development contracts with the signing of the Armistice on November 11, 1918.

G.E. embarked on the development of the Alternate Fighter Engine (AFE) candidate, F101X, in 1975 after over 30 years of success in capturing both military and commercial gas turbine engine contracts. The decision to proceed with the development of the F101X demonstrator came at a time when the prospects for both civilian and military engine development programs were poor and the Navy was contemplating a reengining of its F-14B aircraft. The program gained considerable momentum and support in the late 1970s when the Air Force, DOD, and Congress took interest in developing an alternate engine for its fighter base.

The pursuit of an alternate engine by the government was viewed as a move to ignite a fire under its existing contractor, Pratt & Whitney, to step up their commitment for curing the ailing F100 engine. A number of events, not the least of which were the success of G.E. in demonstrating an engine that had apparently overcome many of the problems plaguing the F100, the perceived lack of progress by P&W in solving the F100 problems, spare part shortages, vendor strikes, and the intransigent attitudes of UTC/P&W's upper management in dealing with their government customer, in the late 1970s helped the Air Force to recruit support for carrying the F101X, redesignated the F101 DFE, into development under Air Force sponsorship. What historians fail to capture in their treatment of this benchmark in propulsion system acquisition is the role that G.E.'s decision making process and strategy played in capturing and fostering support for their candidate engine as well as their strategic approach in dealing with the government customer on the AFE program.

Prior to discussing their strategy, it is best to look at G.E.'s infrastructure and decision process. Figure 2.3 details the organizational structure that was in place at the time when G.E. was developing their strategy and approach for bringing along the alternate fighter engine. Excepting Jim Krebs, those who were players when G.E. decided to launch the demonstrator program continued to be active throughout the development, competition, and production phase. Also, those calling the shots, namely Rowe, Krebs, Ward & Brimelow,

Figure 2.3. G.E.'s Organizational Structure



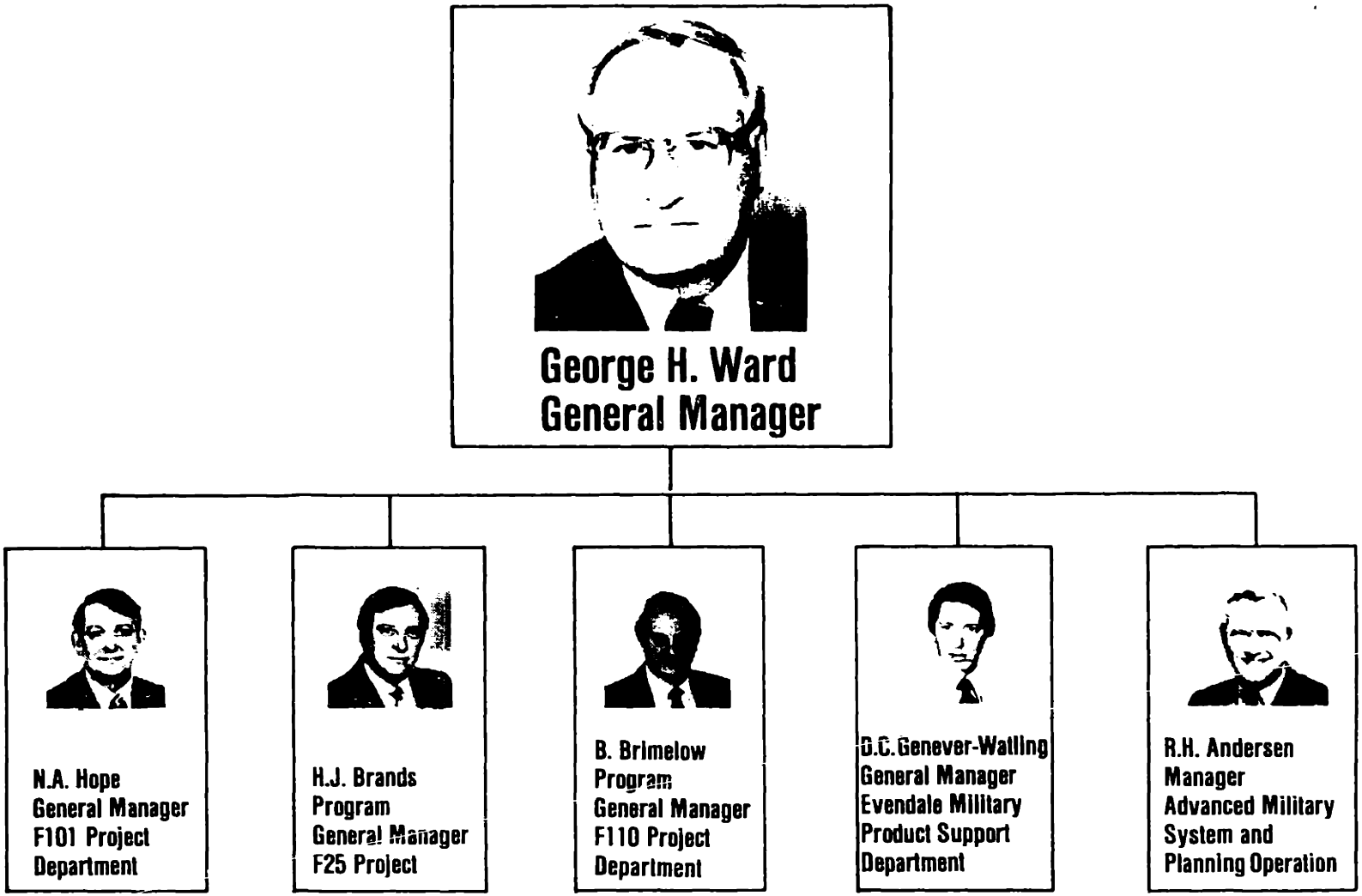


Figure 2.3 G.E.'s Organizational Structure (cont.)

were propulsion people that knew nearly every aspect of the business, especially when it came to dealing with a government customer.

Although the corporate level management was short on engine experience, Rowe contended that reporting to a Chief Executive Officer (CEO) who never had a tour in the engine side of G.E.'s businesses had little effect on the way in which AEBG went about conducting their business. The decentralized nature of the corporation and upper management's approach of providing autonomy to its divisions has contributed greatly to G.E.'s ability to become and stay competitive in the businesses in which they are in today. Rowe characterizes his management style as anything but micro-managing the programs under him. "They (his managers) run the program, they have control of the money...We delegate responsibility down to a relatively low level...I have very little to do with the proposals." (20)

In effect, the people closest to the day-to-day operations and the customer call the shots; a bottoms-up approach to managing the business. As will be described later, a fundamentally different approach was being pursued by their competitor. Ward's view of the role of upper management serves to capture the essence of what Rowe espoused. "Our management is there to help us when we need them."[21/] As expected, the strategy employed in securing support for their development efforts and later in putting together a competitive proposal originated at the bottom of the organizational ladder.

Once formulated, the implementation and execution of their strategy received the support of those in the chain of command. To the customer, it represented a unified commitment by the contractor to do what the customer wanted in a responsive manner. To many close to the F100 issues, it was a welcomed breath of fresh air in an otherwise stagnant environment. This positive perception had much to do with G.E.'s success in obtaining governmental support, notably the Air Force and DOD, for their campaigns.

Brian Rowe succinctly described their approach to going after government business, currently representing 65% of AEBG's business base, as, "We do what they (government customer) ask and then tell them what it's costing them...we work hard to get the customer happy with us." (22) Doing what the customer asks, in the case of the government, normally equates to adding approximately a 10-15% cost surcharge because of the magnitude and complexity of the procurement regulations and associated administration burdens of doing governmental business. But even with this surcharge, government business is still attractive; particularly when considering that it normally represents a constant stream of revenues while also serving as the catalyst for new technology development.

As alluded to in the previous section, G.E.'s decision to enter the fighter engine business stemmed from a look at a declining market, both commercial and military, a desire by Congress and to some extent the Navy to reengine the F-14B, and the beginning of the Air Force's

dissatisfaction with the marriage between them and P&W. With the decision made in 1975 to build a demonstrator program, G.E. went about marketing their products to anyone who would listen. Rowe recalled that,

> We got people interested, against the wills of those who were defending the F100 because their jobs were hanging on the fact that the F100 wasn't successful. We had to get them on our side without offending them. We slowly worked on everybody."[23]

And that they did; first through Congress and the Air Force and then the Pentagon. However, what distinguished their strategy from P&W's was the way in which they marketed their product. As George Ward recalled:

> We never spread dirt about the other guy's product; we played up the insurance policy aspect and came on like apple pie...Our position to the government was if we don't do what we say then throw us out.[24]

Clearly G.E.'s marketing approach of accenting the positive while letting their competitor dig his own grave by focusing on the negative bode well for them in the final analysis. As Rowe commented,

> We always marketed differently than P&W. We have always sold the attributes of our products rather than attacking the weaknesses of our competitor's product."[25]

A key element of G.E.'s business strategy had to do with responsiveness to customer complaints. They have traditionally moved out and fixed the problem and then came to their customers for money whereas P&W had earned the reputation for requiring the money up front

before initiating work on fixing the problem. In actual fact, those who were close to the problems remember many occasions where P&W moved out in advance of securing funding to correct a deficiency. However, as in almost any facet of this form of business, it is perceptions that count; be them in line with the facts or not.

G.E. took every opportunity to capture the attention of those who could influence the process. They worked hard in educating their audience of the F101 DFE's attributes, particularly those which their competitor's product lacked. G.E.'s ability to demonstrate through testing, although limited in extent and scope, that the problems plaguing the F100 could be harnessed while maintaining a high thrust to weight ratio, was a trump card that they played often. Had G.E.'s package only contained paper promises, it's unlikely that the program would have ever gotten off the ground. G.E.'s approach of "giving the customer what he wants...not necessarily what he needs" proved infallible in securing support for their product.

Another aspect of G.E.'s strategy which is often overlooked was the vehicle they used in selling the program. They never really entertained the thought that they would find themselves in a head-to-head competition with P&W for the Air Force's fighter engine business. Instead, they positioned themselves to attract the re-engine market segment, specifically the U.S. Navy's F-14 fighter program. However, as it became clear in 1978 that the Navy was backing away from the idea of developing an alternate engine for fear

that the retrofit cost, estimated to be over $1 billion, would jeopardize other Navy programs, G.E. began to focus their sights on the Air Force market.

Knowing the problems that the Air Force was experiencing with P&W's F100 engine G.E. set out to market their engine development program as an insurance policy while touting the potential benefits of competition, initially to the Navy, and later to Congress and the Air Force. Rowe described their views of how the program would be positioned as, "We never expected to see the F101 DFE in production, but anticipated that the Air Force would use it as a lever to get P&W to fix the F100 problems."[26/] This view, although shared by nearly everyone in G.E. and the Air Force in the early years (1977-79) of the program, evaporated as the initial competition seed sprouted into a fierce production competition between the two air breathing propulsion giants.

G.E.'s success in capturing a major share of the fighter engine business from P&W is, in a large part, attributed to their persistent, yet not obnoxious, pursuit of demonstrating that a viable alternative to the F100, without its accompanying weaknesses, could be developed, produced, and operated at an affordable price. In an atmosphere where the operating and support costs(O&S) for the F100 represented a sizable, almost incomprehensible, portion of the Air Force's spares

budget, and the F100's contribution to the poor readiness posture of the Tactical Air Force (TAF) high on everyone's list, it's easy to understand why the Air Force, DOD, and Congress pushed forward with the decision to bring along the F101 DFE.

B.2 G.E.'S Proposal Strategy

Following the lead of the strategies which had proved so successful in securing government support for their development efforts, G.E. set forth a similar strategy in responding to both the Request for Information (RFI) issued in August 1981 and eventually, the Request for Proposal (RFP) in early May of 1983, that signified the Air Force's official decision to compete the two contractors. Their proposal, although responsive to the RFP, provided some attractive options relative to breakout, multi-sourcing, and warranties. Their proposal strategy was to stress the major attributes of the F101 DFE, redesignated in 1982 to the F110-GE-100, that the Air Force used in selling the idea of competition to Congress. Emphasis was placed on durability, operability, reliability, maintainability and warranties. Although perceived by many at the time as a decision factor, power (thrust) was intentionally played down in their proposal. G.E.'s management saw only negative consequences coming from P&W's frontal assault on the Air Force over the issue of thrust. As such, they chose to leave the issue alone. Instead, they structured their proposal around the explicit issues stated by the Air Force as being important in the evaluation. "The Air Force's problem was readiness brought about by inadequate operability, durability, & reliability... we placed emphasis on these factors when putting together our proposal."[27/]

Recognizing the importance of procurement and O&S costs in winning any share of the business, G.E. set out in 1981 to take cost out of the design. The benefits of their 18-month effort to cut costs paid off in the end. Not only were they competitive on O&S, but they actually came in with an economically attractive engine price. No preferential price biasing was applied in treating the various split options called for in the RFP. Therefore, the Air Force would not incur a penalty if they decided to split the award between the two companies.

As will be discussed later, such was not the case in P&W's proposal. Ward viewed their proposal strategy as doing their best to,

> Get our foot into the door and work to beat them (P&W) on cost with experience... Had we not had the F101 (B-1), resurrected in 1981, and CFM56 contracts, we could never have competed with P&W on price.[28/]

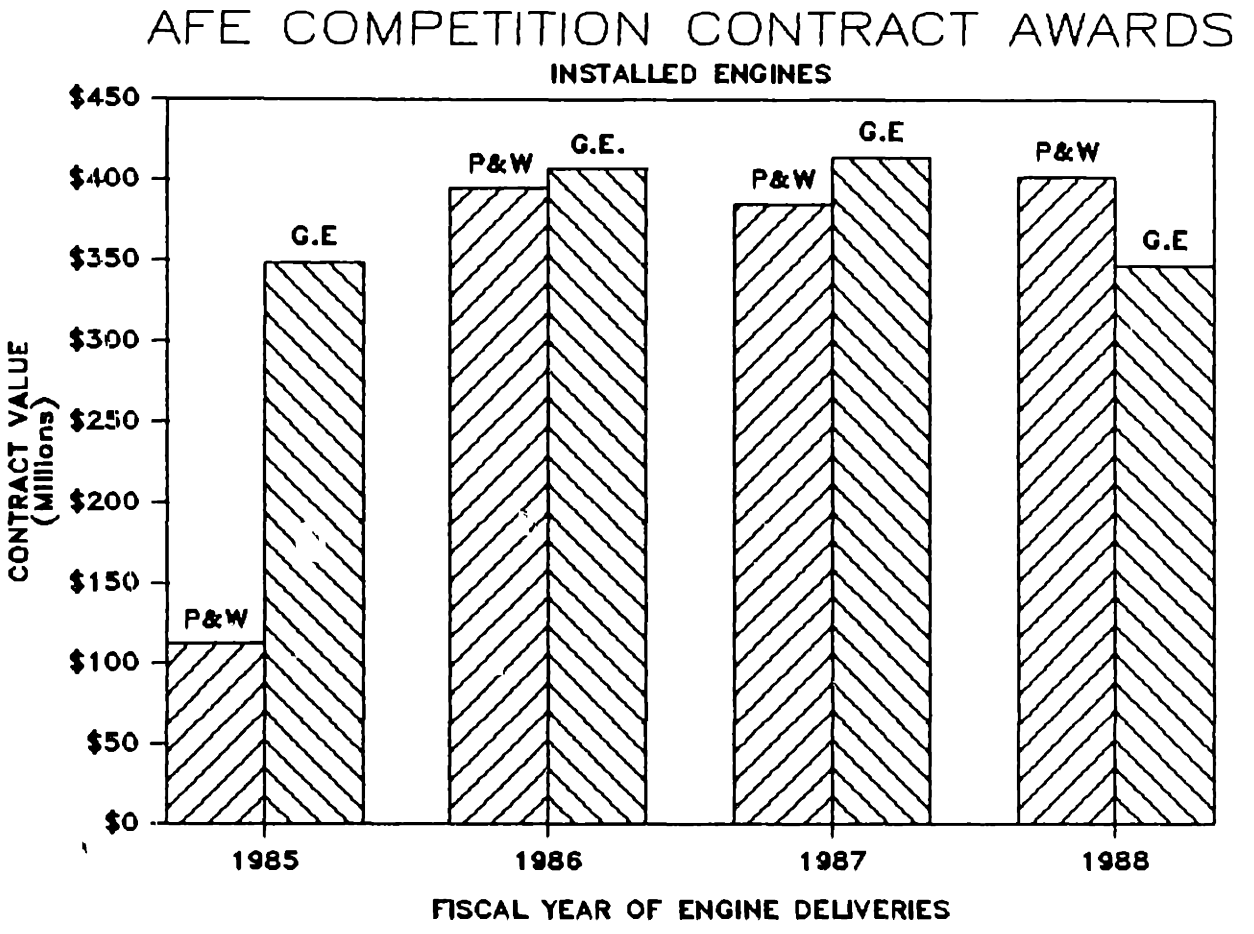
Once the formal competition began, G.E. was convinced that the Air Force would split the award. As Rowe saw it: "The Air Force had been burned before with P&W, so they weren't interested in entering into a sole source relationship again, be it with P&W or G.E.[29/]

As to their expectations, Rowe felt that they (G.E.) would capture approximately 30% of the contract award, while harboring the thought that, "If they really wanted power, then we might get more."[30/] As the record shows, G.E. walked away with 75% of the first year's business, valued at over $300 million, and maintained a slight majority share in the two yearly awards succeeding the original award

in February 1984. P&W recently emerged with a slight majority (55% by quantity) in the FY88 production award announced by A.F. Secretary Aldridge on 3 February 1987. Figure 2.4 contains a summary of the award split for each of the four yearly production contract awards.

Whether thrust was a deciding factor in the split percentages is unknown for sure, but all facts in the case would suggest otherwise. Government officials close to the decision, specifically the Source Selection activity, argue that it wasn't a principal factor. However, even if thrust wasn't a factor in the Air Force's decision, it's hard to argue that it hasn't been a factor in foreign sales. As Jim O'Connor viewed it, "The foreign market is sensitive to thrust and our loss to Israel, Turkey, and Greece can in part be attributed to the thrust advantage of the F110."(31) Whether thrust was a factor in the award percentages is unclear, but it is reasonable to conclude that it wasn't a factor in the decision to split the award. G.E.'s attractive proposal coupled with their customer oriented strategy made it difficult for the Air Force to do otherwise.

Figure 2.4. AFE Production Contract Award Proportionment



B.3 United Technologies/Pratt & Whitney's Structure and Positioning Strategy

Pratt & Whitney (P&W) incorporated, under the leadership of Frederick B. Rentschler on August 3, 1925, entered the aircraft engine business just four months later with the "Wasp", a 415 horsepower air-cooled radial piston engine.[32/] It was three years later, in 1928, that Mr. Boeing, in an effort to "meet the growing requirements of his air transport company,"[33/] moved to undertake a merger with those companies he had worked closely with in the aviation business. The resulting conglomerate, United Aircraft & Transport Corporation (UTAC), joined the major league by becoming one of the three major domestic aircraft engine companies, along with General Motors and Aviation Corporation (AVCO). The marriage quickly came under fire by Congress as a possible violation of the Sherman Antitrust Act. As such UATC found themselves confronted with restrictive legislation that impaired their ability to operate. Rather than having their operations curtailed the congomerate elected to divest itself into three companies; Boeing, United Airlines, and United Aircraft, with United Aircraft comprised of four divisions; Pratt & Whitney, Hamilton Standard, Chance-Vought, and Sikorsky. P&W's entry into the gas turbine engine business with the J-42, an Americanized version of the Rolls-Royce Nene turbojet, came on the heels of G.E. in 1948. Two years later in 1950 P&W, in collaboration with Rolls-Royce, would design and produce a turbojet, J-48 "Turbo-Wasp" which would be acclaimed, at its point of field introduction, as the most powerful turbojet engine flying in the U.S. Pratt & Whitney would become, over

the course of 20 years, dominant in the commercial aircraft engine business with over 90% of the civilian market by the early 1970s. Their commercial market share from that point on would begin to be eroded away by competition from G.E., Rolls Royce, and Societe Nationale d'Etude et de Moteurs d'Aviation (SNECMA). At the time when G.E. made their decision to enter the fighter engine business in earnest, they would hold 25% of the new engine market orders while P&W's share slid to just over 60%.

The 1970s proved to be the decade Pratt & Whitney would make major inroads into the military market. Their success in capturing the Navy's contract for powering the F-14 in Jan. 1969 while later securing lucrative contracts with the Air Force by providing the power plants, initially for the F-15 starting in Dec 1969 followed just five years later with the F-16 fighter in Jan 1975. The F-16 represented the largest ($) potential single engine production contract that the military had let theretofore. With the addition of "anticipated foreign military sales, orders from NATO countries and replenishment spares, the total value of supplying engines for the F-16 alone could surpass $20 billion."[34/] The traditional acquisition policy of sole sourcing production contracts to the contractor selected in the initial competition, coupled with P&W being in a pseudo-monopolistic position with the only high thrust (greater than 20,000 pounds) engine in the market, almost guaranteed a constant stream of military business and high profits for many years to come. However, no sooner had P&W celebrated their success then the troubles which would, over

the course of less than ten years, cause them to lose the bulk of the military engine business to G.E., began.

The competition, unofficially beginning with the Air Force's endorsement (funding) of G.E.'s alternate fighter engine candidate, F101 DFE, in early 1979 and culminating in a reversal of the Air Force's long-standing practice of awarding sole source contracts to engine manufacturers, is viewed by many as a major benchmark in the history of the engine acquisition business. Cooper characterizes the competition and its ensuing benefits as a tribute to the Air Force. "I believe it was the Air Force's finest hour...it exceeded everyone's expectations."[35/] Without question it surpassed P&W's management's expectations. For them it represented a bad dream which sent repercussions throughout all levels of UTC/P&W. Never had they anticipated that much of what would occur to keep the fire burning under the competition was a direct result of their strategy in trying to get it turned off.

Contrary to G.E.'s bottom's up decision making process the UTC/P&W of the late 1970s operated with more of a top down process. Where G.E.'s managers were provided with a great deal of autonomy in formulating their competitive strategies, UTC/P&W corporate management took charge of the strategy formulation while also making the tactical decisions. Figure 2.5 contains a breakdown of the organizational structure that was in place when the competition got off the ground in 1981. From the very birth of the competitive threat Gray & Carlson

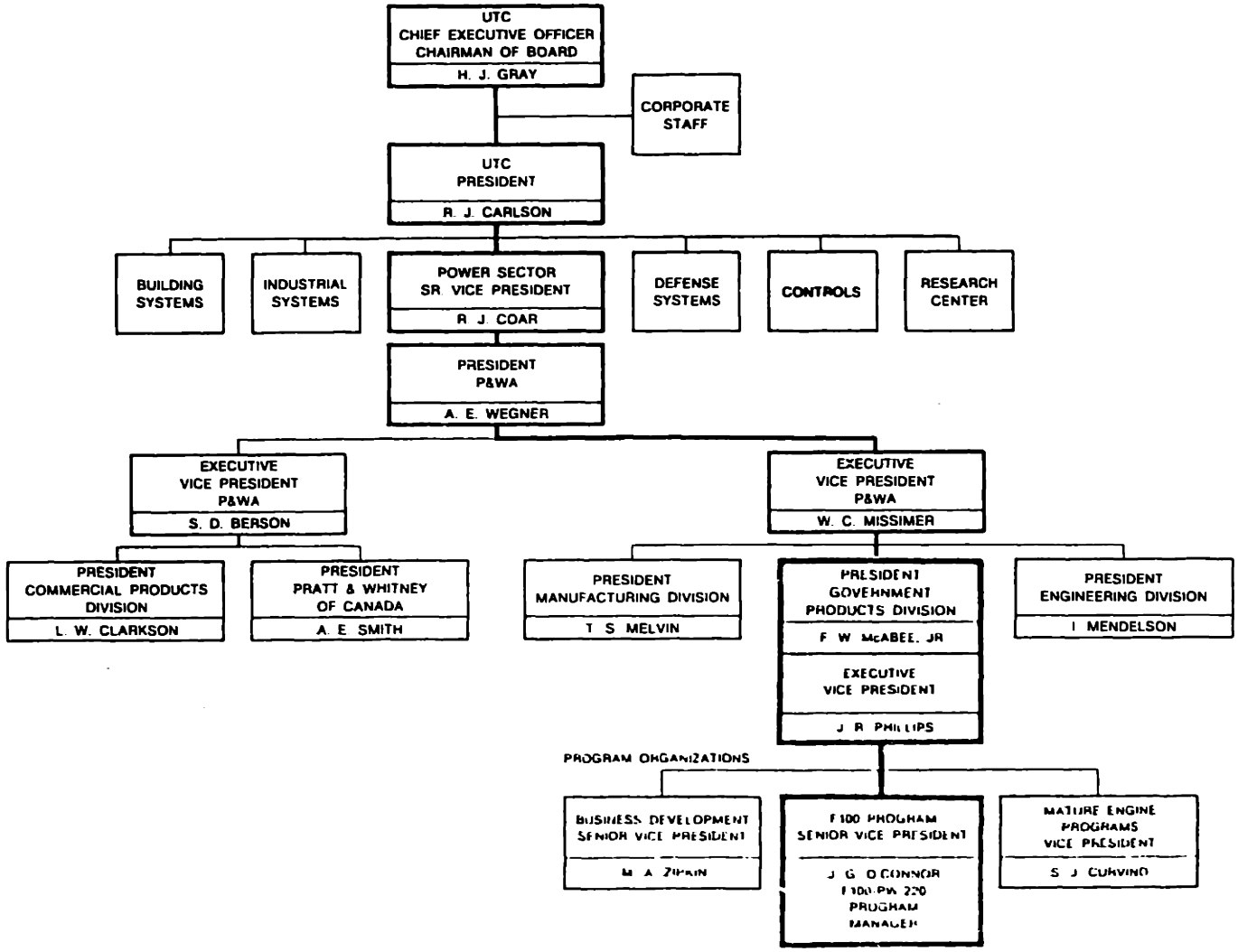


Figure 2.5 P&W's Organizational Structure

inserted themselves into the picture, both in taking their case to Congress and in making the daily decisions that would guide UTC/P&W down the road to defeat.

Neither Carlson nor Gray had come up through the engine side of the business or were all that familiar with the propulsion business. Gray had taken over as Chief Executive Officer(CEO) of UTC in 1971 after being recruited from Litton, while Carlson joined the business in December 1979 assuming the position of President, Pratt & Whitney Aircraft. Later on Carlson would be selected to fill the position of Executive Vice President, United Technologies Corporation, while retaining his title of P&W's President. Their lack of familiarity of the business did not hinder them from calling the daily shots while pursuing a strategy that ran counter to the advice of those in the company that knew the business and customer. At times it was difficult to see where Carlson and Gray were headed with their attack. It appeared that they had forgotten the past, particularly how P&W had become so successful in capturing government business in the 60's and 70's. The old adage that "the customer is always right" was replaced with "we know what's best for our customer." The responsive receptive Pratt of the early 1970s shed the very attribute that had made them successful, only to adopt an arrogant recalcitrant unresponsive demeanor that would do more to fuel the competition than suppress it. G. Ward viewed UTC/P&W's senior management's approach as, "They (Gray & Carlson) didn't understand competition otherwise there wouldn't have been one."[36/] He looked at Gray & Carlson as

part of G.E.'s frontline team, "I always said our team was Brimelow, Krebs, Carlson, Gray, and myself."[37/]

P&W's inability to get their corporate management to disengage resulted in the rooting of a fragmented, often destructive strategy. When G.E. looked at the role of upper management as being "there if you need them" P&W had no choice but to see their corporate management as being there leading the charge of a "ghost brigade". Although on the surface there appears to be a great deal of similarity in the structure of the two corporate giants, the nature of the decision process interconnecting the various elements were radically different. The fact that since the contract award in 1984 G.E. has chosen to retain their system while UTC/P&W has realigned theirs, makes it easy to deduce which system was viewed as being the most effective in attracting and securing government business. The P&W of today is aiming to be more like the P&W of the late 1960s. Decentralization of the decision process is becoming as important as the existing underlying structure.

While G.E. was out soliciting supporters for their fighter engine, P&W's was building a counteroffensive strategy to thwart G.E.'s efforts, not realizing that their strategy was flawed and was doomed to failure. As McAbee recalls, some of UTC's upper management built their offensive strategy around the assumption

> that this was just another ploy by the Air Force to hammer UTC/P&W into lowering the price of the F100 while capturing our attention...Our senior management

> thought they could change things and that the Air Force wasn't serious and couldn't really afford to do it (hold competition).[38]

Many believe that much of what happened, particularly the Air Force's steadfast commitment to continue their pursuit of bringing G.E. into the fighter business was in response to P&W's lack of appreciation and concern for their customer's problems. Bill Missimer faults UTC/P&W for "not appreciating the depth of concern and resolve on the part of the Air Force to get our attention."[39] However, this created a dichotomy for many of those who were working hard to solve the F100 problems. The problem wasn't with those closest to the business who realized that a concerted effort was underway to fix the F100, but rather the perceptions of those at the top who saw little more than a never ending stream of problems with P&W's emblem imprinted on them. "The perceptions of Air Force top management was that the top management at UTC/P&W were not so committed or appreciative of the problems... We had earned the reputation for callousness, commercial orientation, and lack of responsiveness."[40]

With the situation in the late 1970s characterized by vendor strikes, spare part shortages, a dismal readiness and support posture, staggering replenishment spares bills, an unresponsive arrogant contractor, and a customer who was "damn frustrated with the management of UTC/P&W,[41], it came as no surprise to see the Air Force, Congress, and DOD seize the opportunity to bring a real threat into the picture. It wasn't a failure by the "messenger" to give

UTC/P&W's management the full story but rather management's failure to believe and react to it in a manner that would have signaled their commitment for getting the program back on course. Instead, UTC/P&W fired a shot across the Air Force's bow and took their case to Washington, circumventing the Air Force.

As to why senior management at UTC/P&W chose to fight rather than acquiesce is unclear; however, it stands to reason, given their strategy, that they felt the best defense was a strong offense. This decision dismayed and disappointed those who felt otherwise. As McAbee recalls, "Many of us felt that they (Air Force) were serious and that there was likely to be a split market and that we should position ourselves to capture the majority"[42/] Similarly, Jim O'Connor's advice to his corporate management was that "the Air Force has made their mind up to hold a competition and its likely that the award would be a split...we should position ourselves accordingly."[43/]

One message is clear: UTC/P&W's approach ran contrary to the advice of those individuals in the middle of the battle who understood their customer and the strategies that would likely prove effective in the end. UTC/P&W's senior management, specifically Carlson and Gray, chose to employ a strategy characterized by McAbee as:

> Resist to the maximum degree to the bitter end, and that if there was a split, we would submit a proposal that was so good that they (Air Force) couldn't afford to split it and thus would have to give it all to us.[44/]

This attitude and resulting strategy would cause them to suffer a major loss to G.E., both in market share and morale. This strategy might have been effective had the circumstances and environment existed that prevailed in the 1960s or early 1970s. However, with the Air Force's prior sole-source experience on the F100 leaving a bad taste in their mouth, it was unlikely that they would enter into another single-source arrangement when provided with the opportunity of doing otherwise. Cooper portrays the situation as: "We weren't interested in going 100% with one guy...We had no more interest in getting into bed with G.E. then we were with P&W."45/

In fact, the Air Force's intention of splitting the award was made clear from the very outset of the decision to hold a formal competition. Lt. General Kelly Burke, Air Force Deputy Chief of Staff for Research, Development, and Acquisition, testified to the Senate Defense Appropriation Subcommittee in May 1982 that

> ....it is the Air Force's intention to compete the buy each year and split the orders 60%-40% or 70%-30%, thus sustaining competition... it's almost out of the question that we would go 100% to one contractor unless the other engine manufacturer collapses."46/

Excepting a few at the top, UTC/P&W's management held the same belief.

UTC's senior management, working indirectly through their Congressional supporters and directly by providing testimony at defense subcommittee hearings, tried in vain to stop the competition

from gaining momentum. Congressman Toby Moffett's (CT) letter to Air Force Secretary Orr captures the key aspects of the UTC/P&W strategy

> ....split production, in addition to undermining economies of scale, could adversely affect P&W's viability as a competitive manufacturer of fighter engines... These good faith efforts indicate that P&W deserves an opportunity to remain the sole manufacturer of the Air Force's F-15 and F-16 engines."[47]

Carlson took the opportunity during his testimony to the Senate subcommittee to reemphasize what he perceived to be the major issues/concerns surrounding the Air Force's decision to host a competition while keying off of Burke's comments. "That engine (F100) is this company's only military engine business of consequence for the decade ahead".[48]

UTC/P&W's continuous attack on the competition, first on the basis that it wasn't cost effective, then by attempting to discredit their competitor's product, and finally by arguing that the competition wasn't fair since G.E. had a higher thrust engine and thus retained an unfair advantage, are best viewed as strategic blunders by a few, that ran counter to the advice of many. Carlson's obsessions with the thrust issue came through loud and clear in his remarks before the Senate subcommittee:

> I don't think thrust is an issue in this competition, I think thrust is THE issue and any decision by the Air Force not to opt for the kind of performance you can get with the thrust level represented by the F101 DFE, I suggest would border on irresponsibility for the Air Force to recommend, and for Congress to support.[49]

Missimer, along with many of his compatriots, felt that they were doing more harm than good in their attempts to stop the competition, particularly when they went after the thrust issue. "It (thrust issue) was a lose-lose situation all around...underlying it was a lack of trust of our customer."[50/] These actions further entrenched those who believed competition would yield benefits in excess of its cost while helping to win the support of the more skeptical. McAbee remembers, "...it (UTC/P&W approach) bothered me tremendously. I was convinced that it wouldn't work."[51/]

However, the policy that underlied their (Gray & Carlson) strategy up to the point where it became apparent that the competition would proceed was simply "to kill the competition." The people (Gray & Carlson), under the most heat by the board of directors and shareholders, were clear in their resolve to stop the competition. Why they persisted with their efforts, particularly on the political front, to stop the competition was, in the view of Fred Rall, Air Force Aeronautical Systems Division(ASD) Technical Director and member of the SSAC, "the only way for them (UTC/P&W) to prevent what they considered to be a preordained outcome."[52/]

Others argue that their misguided strategy was an outgrowth of having people who didn't know the business formulating their approach with little consideration for the opinion of those who did. Gray's and Carlson's decision to take charge publicly, in leading the campaign to stop the competition, was perceived as a strategic error

by Bill Missimer. It's easy to understand why they chose to do so with a "nothing to win and everything to lose" situation confronting them but to go on record in the middle of the battle downplaying the importance of the F100 engine program to UTC/P&W was ludicrous. Carlson's quote, captured in the Hartford Current in March of 1983 help seal their fate.

> [Regarding] the development of the new technology busting commercial engines plus a third engine being developed... Pratt's biggest concern right now is to get those three engines into production in time for an expected revival of the commercial market. If the company succeeds, it won't mean a tinker's goddamn whether the F100 stays or goes, not a damn thing.[53/]

In addition to destroying what little support they had in their quest to stop or delay the competition, it did irreparable damage to those within P&W who had worked long and hard to defend the F100 business base and knew that Carlson's statement flew in the face of the facts. Missimer's reaction to the statement was "I almost died when I read it... it was completely in opposition to the facts".[54/] McAbee recalled that when he received a heads-up from a friend of his in public relations, "I thought I would die."[55/] It wasn't until over a month later that Carlson defended his comment to McAbee's staff. He contended that the journalist didn't have the slightest idea what the business was about and that UTC/P&W was giving all of their attention to the commercial business. As such, recalls McAbee, "Carlson stated that he had to say something to convince him (journalist) that this wasn't the case. He thought the strongest statement he could make was one which denigrated the F100."[56/]

Eugene Montany, P&W V.P., Strategic Planning, although providing much of the impact or jeopardy statements relating to UTC's/P&W's business base, had little involvement in the strategy employed by UTC/P&W in the "Great Engine War". Montany commented that

> .... "when the actual strategy that was put forth by UTC/P&W was being formulated it was limited to a few people at the top... not those in the strategic planning groups."57/

The data being supplied to Carlson supported his statement about the F100, providing that the commercial market had grown at the rate being projected. As it turned out the commercial market made a downturn destroying the likelihood that Carlson's statement would ever come to fruition. If senior management believed the data then why did they elect to go for broke rather than putting forth a strategy that would ensure the maximum chance of capturing a majority share of the F100 business? It appears that UTC/P&W's senior management could not come to accept the situation before them, regardless of how many times they heard it. "We weren't able to convince our senior management of the seriousness of the problem...Competition did a much better job of it."58/

B.4 UTC/P&W's Proposal Strategy

Unlike G.E.'s approach in submitting a proposal that would be equally appealing regardless of the split percentages, UTC/P&W chose, against the recommendations by many within the company and contrary to the undercurrent of governmental support for multi-sourcing, to go for broke. Their proposal strategy, like their approach in trying to stop the competition, did more to damage their chances of coming out on top.

In fact, while the Air Force was putting the finishing touches on the draft RFP, P&W, in a last-ditch effort to sideline the competition, sent an unsolicited proposal to the Air Force in December 1982. The proposal contained a "one time good deal" offer for a multi-year fixed price contract on nearly 2300 existing vintage F100 engines inclusive of warranties and guarantees. Acceptance of the offer would serve to retain P&W's lock on the fighter engine market, thereby stopping G.E.'s entry into the market until P&W could posture themselves to compete on equal footing (thrust) in the late 80's.

Shortly after submitting their unsolicited proposal, Gray sent a letter to nearly every high ranking government official, including Defense Secretary Casper Weinberger, Congressmen, Executive Department, OSD and Air Force personnel encouraging them to consider in earnest their unsolicited proposal while rescheduling the competition to later model aircraft engine procurements. The Air

Force chose not to budge from their position of seeing the competition through to its natural conclusion.

Various opinions and views have been presented for why the Air Force elected not to consider/accept P&W's offer:

> "Although Pratt offered a good proposal, the Air Force believed an even better deal awaited by continuing with the competition."[59]

> "P&W hadn't lived up to their past promises...had it been the old P&W the Air Force many have accepted it."[60]

> "We were committed to the competition...there was nothing to lose in going forward."[61]

> "Competition is in fact working... why quit now... besides, acceptance would undermine one of the factors upon which the decision to compete was based, namely, enhancement of the industrial base."[62]

However, those in the Air Force close to the source selection that was about to commence argued that the Air Force wasn't at liberty to review the proposal since the draft RFP had been released. McAbee anticipated that due to the way senior UTC/P&W management interjected themselves in orchestrating the proposal during the eleventh hour that "...our proposal strategy would fail and we would get less than 50% of the business... it just wasn't a rational proposal."[63] As O'Connor saw it, the proposal that had been submitted to corporate had a fair chance of capturing 65-75% of the business. However, after amending it to reflect the changes directed by corporate management "I really didn't have a good idea of the outcome... the Air Force was pissed off

at the way we structured our proposal."[64/] The proposal had been intentionally biased such that anything other than 100% award would make their proposal extremely unattractive, principally on the cost of warranties for a split award.

In the end, both proposals would be assessed as meeting the minimum source selection acceptance criteria with G.E.'s 100% option being the most attractive over any permutation or combination of split awards. P&W had gamed their proposal hoping that they would walk out of the competition in a position no different than when they went into it. This was clearly not where the Air Force intended to find themselves, barring having to reject a proposal for noncompliance or disqualification of a contractor, at the conclusion of the competition if they could find a way around it.

The award decision "being made, by definition, on the basis of an integrated assessment of all areas; costs, logistics, technical, past performance, management structure, etc."[65/] provided the AFE Selection Authority, Secretary Verne Orr, a good deal of latitude in deciding the outcome. UTC/P&W's senior management's unwillingness to accept the inevitability of sharing "their" high thrust fighter engine market with G.E. had a pronounced negative impact on virtually everything they did before and during the formal competition.

The award announcement, giving G.E. the lion's share of FY 85's engine business sent a shock traveling through UTC/P&W's headquarters,

unseating those who fought hard and lost. Almost overnight UTC/P&W revolutionized their strategy in dealing with the government, particularly the Air Force. That which had failed was discarded. A hard lesson had been learned and they weren't about to let it happen again. McAbee observed that "the system changed radically after the initial AFE awards... it is continuing to change since Gray's departure in December 1986."[66/] Cooper believes that the Air Force gained considerably through the hosting of the competition "more than the tangible savings realized on the contract... it's hard to put a dollar figure on it."[67/] Truly, an event that would go down in Air Force history as a pièce de résistance.

C. AFTERMATH

As espoused by those closest to the battle, competition did much more than provide the Air Force with an economically attractive package from which to choose its future fighter engines. The intangibles were as significant as the quantifiable benefits that encircled the competition from the beginning. However, the aftershock felt by UTC/P&W was as pronounced as the initial shock that accompanied the Air Force's selection of G.E. as the unequivocal winner. Within a week of the Air Force announcement, putting G.E. back into the large fighter engine business, the Navy selected G.E.'s engine for equipping future versions of their F-14 fighter. The Air Force and Navy's endorsement was quickly followed by Israel, Turkey, and Greece in selecting G.E. to power their respective U.S. built fighters.

The inevitable had happened; UTC/P&W found themselves confronted with a major loss that would financially weaken them for years to come. Although they would soon make a remarkable turnaround in capturing development contracts, their cash cow (F100 production) had suffered a major setback. Even today P&W still bears the financial scars from this loss: "P&W is not that healthy today... you can trace it back to the AFE decision."[68/]

Almost overnight UTC/P&W began a major campaign to rebuild the relationship with their government customer while taking the necessary

steps internally to remove those individuals "credited" with formulating their mistargeted strategy. The first positive gesture came with their offer to restructure the warranty bringing the cost back in line with G.E.'s. UTC/P&W's reaction to the decision debrief provided to them and G.E. was that the Air Force had been true to their word in making the assessment on the basis of the explicitly declared criteria. It was up to them to take the next step. As Missimer remembers "we decided to bury the hatchet and move forward, showing our customer what we're really made of by delivering a quality product and standing behind it."[69/] Meanwhile, the Air Force was receiving accolades for their success in achieving a major milestone in the move towards revamping the defense acquisition process.

Congress, one of the first government entities to commend the Air Force for their achievement, did so while taking credit for their role:

> Breaking up the monopoly that Pratt & Whitney has enjoyed for a dozen years is a long step in the right direction... Although I believe Secretary Orr wanted to get competition into military contracting I do not believe he could have broken the Pratt & Whitney monopoly without the congressional criticism...[70/]

Even a Government Audit Organization (GAO) review of the decision, initiated at the request of Senators Weicker and Chiles, hailed the Air Force source selection process and resulting outcome.

> The Air Force planned and executed the source selection in compliance with its established policies and procedures... In our opinion, the Secretary's reasons plus the fact that neither engine has yet been fully tested, provide sound bases at this time for splitting the 1985 award and continuing the competition/[71/]

The other services and Congress wasted little time in building upon this new competitive foundation in their dealings with companies aiming to capture government business. A deluge of new legislation and regulations mandating competitive procurements, warranties, etc., as the norm rather than exceptions in defense acquisitions quickly passed through Congress. In fact, these new regulations go a long way in making it difficult to justify (economically) sole source contract arrangements between industry and government. Additionally, comprehensive warranties have since become an integral part of contract negotiations with the stipulations that "they (warranties) have got to pay for themselves... they are not just going to be accepted carte blanche."[72]

But has the inertia for change become so great that the government's infatuation with competition had the effect of moving the process beyond the reach of those responsible for managing it? Some argue accordingly, citing the government's move to require breakout and multi-sourcing. Others view the Navy's initiatives of requiring G.E. to transfer the production technology to P&W for the F404 engine, as a shortsighted publicity stunt which will likely have long term negative consequences for all concerned. Jim Day, Director of Engineering for the Air Force's Deputy for Propulsion, believes that

> ...the pendulum has swung too far the other way... we are facing an environment today where people are trying to figure out how to get around competition so that they can get effective systems into the field in a timely manner... we may have reached the point where the tail is beginning to wag the dog."[73]

An in-depth look at where industry and government officials believe the defense acquisition business is headed in light of the vast changes that have swept through it since the AFE competition will be undertaken in Chapter 4. For now it is sufficient to say that the AFE competition opened the eyes of many who felt that the monolithic giant was incapable of change.

The intangible benefits realized from the AFE competition were many and varied. UTC/P&W's attitude and responsiveness changed almost immediately. Cooper believes that the outcome has not only had positive effects on the government's relationship with UTC/P&W but has also "sent a very, very powerful signal to the rest of industry that the Air Force is a customer that won't stand idle and let a contractor walk over them."[74/]

As to the acclaimed tangible benefits, specifically the projected $2-3 billion savings in Life Cycle Costs(LCC), Cooper feels that it is too early to claim total victory. "We need to sit back and look at how they (contracts) turn out."[75/] However, it is important to realize that competition has postured the government well for future high thrust fighter engines. Growth (thrust) versions of both competitor's engines are currently under development. These derivative programs will provide the engines to power the service's fighters into the turn of the century. Additionally, both contractors are under contract with the Air Force to demonstrate new generation engines which are likely to someday compete for the Advanced Tactical

Fighter (ATF). Given the proclaimed benefits of maintaining two production products and sources, it is almost a foregone conclusion that a similar competition procurement process, culminating in split awards, will be pursued for these future engines.

UTC/P&W's success in capturing a slight majority of 1987's split award after three years of receiving a minority share reflects their ability to come back from a defeat that many felt would inflict irreparable damage to the extent of impairing them from ever becoming a leader in the fighter engine business again.

True to form, UTC/P&W grabbed the bull by the horns and went after their competitors following a course not unlike that charted by G.E. in securing a foothold in the large fighter engine business. Much of their (P&W's) success in making inroads into many of the markets enjoyed by their competitors is a result of a conscious decision to stay in the business while taking a longer term perspective when formulating the strategy that would carry them forward into the 1990s.

Implementation of this strategy was accomplished in conjunction with a reorganization that seemed to provide the flexibility and autonomy necessary for it to be effectively executed. As Missimer recalls, "the way we do business today is not the same as before. Our division presidents have much to say about their strategies... they are the masters of their own fate today."[76/] Jim O'Connor endorses

this view: "UTC/P&W of today has more autonomy at the lower levels."[77]

As an outgrowth of the way in which corporate senior management inserted themselves as the policy makers during the AFE competition a committee was formed to oversee policy issues dealing with government business. This committee's charter includes deciding how to deal with particular initiatives of the government in addition to giving approval on responses to contract issues.

As to which lessons, born out of the competition, have had the most impact on the way P&W approaches their engine business today, Missimer feels they include a recognition that:

1) the customer is always right

2) P&W needs more military engine products

3) P&W needs to step up to taking greater risks than in the past, particularly as it pertains to warranties

4) emphasis must be placed on designing for producibility, not just performance.[78]

Their response to these lessons has taken the form of getting into new markets with a wider range of products which contain those features that their customers want. P&W's strategy reflects the changing nature of the propulsion business, both domestically and globally. O'Connor describes their strategy for the future as:

> First to win back credibility from our customer by delivering what we advertise. Next, by taking a more global perspective of the military business, and finally to rebuild market share by (a) remaining

> dominant in fighter engines (b) getting into other defense air breathing propulsion markets inclusive of airlift, strategic, and more importantly the small engine business (c) placing emphasis on building their space propulsion products.[79]

A look at their recent successes in

(a) capturing a majority(55%) share of 1987's fighter engine contract,

(b) being chosen to provide the power plants (PW2037) for the Air Force C-17 airlift transport,

(c) being selected as the second-source for the Navy's F404 engine,

(d) securing a development contract to produce a higher thrust derivative of their F100 engine,

(e) capturing a joint contract (P&W and Avco Lycoming) to develop an engine for the U.S. Army's LHX (light helicopter experimental) and

(f) obtaining a contract for developing a mixed cycle propulsion system for the National Aerospace Plane (NASP),

suggests that they are off to a good start.

Sustaining this buildup of their defense business will depend upon factors (domestic and international competition, defense budgets, procurement policies, etc.) which are outside of their direct control. One thing is for certain, P&W has reentered the race well equipped to take maximum advantage of the track conditions.

As for G.E., they concentrated their effort on making the best of the opportunities afforded them by the Air Force decision in 1984. Their resounding success in capturing other markets, domestic and

international, for the F110-GE-100 engine is understandable and predictable. There has been little reason for them to change a winning combination of strategy and structure.

Probably the largest challenge before them has been to produce the large quantity of engines contracted while assuring that the product delivered to the field incorporates the award winning attributes which helped gain it a place in the government's arsenal. With the F110 it is going to be difficult, at best, to meet the grandiose expectations that precedes it. The reputation that G.E. earns in standing behind their product, especially how they come to be viewed in responding to their government customer, will contribute much to G.E.'s success in coming out on top in future government business.

On the other hand the task before P&W is far less formidable. Their F100-PW-220 engine is likely to be evaluated principally on how it performs relative to the 3000 plus older, less capable, F100 engines in the field today. As noted earlier, perceptions count a great deal, particularly at the higher levels in government where the power exists to initiate change with the stroke of a pen. It is also no coincidence that propaganda about the "new" engines that floated up to the higher levels of government tended to inflate the attributes while suppressing the negatives.

Although it will be hard for either engine to meet all the claims that have gone before it, less attention will be drawn to the

F100-PW-220 if it still proves to represent a marked improvement over its ancestors. Such will not be the case for the F110-GE-100 engine, where the image surrounding it can only be degraded by field experience. Also, it may be more than a mere coincidence that P&W's success in capturing a majority share of the latest round in engine awards comes on the heals of the negative publicity that surrounded the heroic action by an Air Force pilot in safely landing his F-16 outside Chicago after experiencing a failure of his one and only F110-GE-100 engine.

Finally, the Air Force's decision to annually re-compete the production contract is viewed as a sign that they are intent on keeping their options open. The fact that each succeeding year the contractors have sweeten their respective proposals underscores the significance of the Air Force's decision to take maximum advantage of the competitive uncertainty surrounding a yearly revaluation. To give the Air Force complete credit for making a conscious choice four years ago to go annual with its production contracts would be to understate the importance of P&W's proposal strategy, albeit they didn't realize it at the time, in "encouraging" the Air Force to do accordingly.

The reasons behind the Air Force's decision to handle the production awards as they did is of little significance when contrasted to the credit rightfully bestowed upon them for moving the government into a new era of defense acquisition. However, as with any fundamental change to an existing process moderation needs to be

exercised in order to avoid sparking a negative reaction that more than offsets the potential benefits. As will be discussed in Chapter 4, Congress is doing anything but exercising moderation in enacting new legislation, further constraining an already severely restrictive process.

CHAPTER 3

CONCEPTUAL ANALYSIS OF STRATEGIES, DECISION PROCESSES AND OUTCOME

A. DESCRIPTION OF THE CONCEPTUAL FRAMEWORK

With the environment characterized, via a brief description of the history, impetus, and process that brought the AFE competition to be recognized as a milestone in defense acquisition, it is possible to view the AFE selection process and competitive strategies employing Allison's multiple lenses. As alluded to in the prior sections, the process of actually selecting "winners" is, superficially, straight forward and rational. However, when the stakes are high, as they were in this competition, the process can rapidly become a battlefield with survival dependent upon the strength of strategic alliances, influential power of the stakeholders, and the tactics employed; where even in an environment ripe for revitalization of competition and the source selection process it entrains, both can become targets of extreme criticism.

Before proceeding with the analysis of the different moves that ultimately led to "G.E. putting a checkmate on P&W,"[1/] it is necessary to establish a framework which will be employed in explaining the strategic moves and reactions by the various

stakeholders. Not unlike the Cuban Missile crisis, the AFE competition involved high stakes, multiple constituents, influential people, explicit and implicit issues and strategies, public awareness, and most importantly, the need for complex decisions that would charter the course of the future.

Allison's conceptual framework categorizes the decision processes as conforming to one of three paradigms; rational actor, organizational, or political. This framework fits nicely when taking an objective view of the decisions which ultimately determined the outcome of the AFE competition.

In order to gain an appreciation of the three models or grids that will be used in treating the actions and responses of the key stakeholders, it is best to capture the features of each model. Figure 3.1[2/] does this by providing a capsulated summary of each model's salient features which distinguishes it from the rest.

The classical or Rational Actor Model serves to reduce the process by which an entity, be it a corporation or government organization/ agency, makes decisions down to a single actor. It equates to blinding out the facts that, although contributing to the outcome, appear to play an insignificant role. The model is founded on the premise that the behavior of these entities can be readily explained as rational actions on the part of the different constituents operating within a domain bounded by a set of constraints. Simply

Summary Outline of Models and Concepts

The Paradigm	Model I	Model II	Model III
	National government Black box Goals (objective function) Options Consequences Choice	National government Leaders A B C D E F G Organizations (A–G) Goals SOPs and programs	National government A B C D E F Players in positions (A–F) Goals, interests, stakes, and stands (r-z) Power Action-channels
Basic unit of analysis	Governmental action as choice	Governmental action as organizational output	Governmental action as political resultant
Organizing concepts	National actor The problem Static selection Action as rational choice Goals and objectives Options Consequences Choice	Organizational actors (constellation of which is the government) Factored problems and fractionated power Parochial priorities and perceptions Action as organizational output Goals: constraints defining acceptable performance Sequential attention to goals Standard operating procedures Programs and repertoires Uncertainty avoidance (negotiated environment, standard scenario) Problem-directed search Organizational learning and change Central coordination and control Decisons of government leaders	Players in positions Parochial priorities and perceptions Goals and interests Stakes and stands Deadlines and faces of issues Power Action-channels Rules of the game Action as political resultant
Dominant inference pattern	Governmental action = choice with regard to objectives	Governmental action (in short run) = output largely determined by present SOPs and programs Governmental action (in longer run) = output importantly affected by organizational goals, SOPs, etc.	Governmental action = resultant of bargaining
General propositions	Substitution effect	Organizational implementation Organizational options Limited flexibility and incremental change Long-range planning Goals and tradeoffs Imperialism Options and organization Administrative feasibility Directed change	Political resultants Action and intention Problems and solutions Where you stand depends on where you sit Chiefs and Indians The 51–49 principle Inter- and intra-national relations Misperception, misexpectation, miscommunication, and reticence Styles of play

Figure 3.1. Allison's Conceptual Behavior Models

stated, the rational process is seen as a "value maximizing" solution to a complex problem. It becomes useful when attempting to answer the question of what is the problem being addressed and why did a particular event/action occur. Model I is probably the most commonly used method for attempting to explain or rationalize the cause and effect of different events. If one is able to explain a decision or action using the Model I concepts it's unlikely that he/she will go any further in the pursuit of the basis for a decision. However, when a particular action or event cannot be dealt with simply as a logical rational choice or consequence of the available alternatives, one needs to look to other paradigms for assistance. These typically come into play when the decision or event is not the resultant of an individual's action but rather that of a bureaucratic organization or political body.

To understand the behavioral characteristics of these models requires viewing the decision process as something other than rational. However, this isn't to imply that the actions of the individuals are irrational. Rather, other factors which do not lend themselves to reason or logical expression come into play in the decision process.

Allison's Organizational (Model II) and Political (Model III) models serve to capture the processes by which other than totally rational decisions may arise. The Organizational model can be viewed as the decision process wherein explicit conformance to rules or

standard operating procedures (SOPs) serves to define, or often confine, the result to a predictably restrictive decision set. Innovation is a must if one strives to reach a decision different from that which has historically evolved from such a process. The Organizational paradigm is particularly appropriate when attempting to explain a government agency's behavior patterns. The institutionalization of standard approaches to many decision processes has evolved due to inconsistencies, often contradictory in nature, of decisions on similar issues. The SOPs that enshrine the organizational decision processes are often viewed as excuses rather than reasons for a particular decision.

When the resulting outcome of an organizational decision process is favorable little credit is given to the process for its success. Yet, when the result is failure, the inflexibility normally associated with the behavioral characteristics of the organizational process are blamed. As will be discussed later, the organizational decision process played a key role in the survival of the AFE competition.

Turning to Model III, it's possible to view it in a similar light as Model II, where an understanding of a decision or action requires acceptance that something other than a rational process is operative. As with Model II, Model III takes into account another factor, namely politics, when attempting to explain the actions or decisions surrounding an event. It is reasonable to assume that only a few highly visible decisions involving large stakes can be properly

treated without an *a priori* recognition that the outcome, at least in part, was influenced by politics. The relative political power of different stakeholders serves to guide an otherwise rational or organizational process. The contribution of each model to the understanding of a particular event is likely to be proportional to the stakes and perceived consequences of various actions. The notion that any event can be broken down and viewed as the product of decisions conceived from either a rational, organizational, or political process is to presume that all decisions can be characterized by one of the three distinct models. As will become apparent in analyzing the key events surrounding the AFE competition, Allison's three models are neither mutually exclusive nor collectively exhaustive. However, they do provide an excellent foundation to build upon.

On the surface it would appear as though the outcome of the competition could readily be explained by the Classical or Rational Actor Model(Model I). In fact, barring a few minor diversions, the decision to host a competition is understandable when approaching the subject rationally.

Simply put, the environment was right, both with the external pressures being placed on moving the acquisition process back towards competitive procurement and internally, with the difficulties the Air Force was experiencing in dealing with their sole source "recalcitrant" contracter, P&W, while General Electric was standing at the altar

ready to enter into an attractive marriage with the government to develop an alternative engine for the job. Clearly a win-win proposition for both the Air Force and G.E. The environment created by these events is captured in a Harvard University case study quotation by Dean Gissendaner, an Air Force staffer: "We had a contractor that wasn't responsive and we had the opportunity at least to demonstrate a capability to have some competition.[3/]

Before attempting to conceptually treat the government's AFE competition selection process, particularly the key decisions which ultimately led to the unprecedented outcome of splitting the Air Force's fighter engine business between General Electric and Pratt & Whitney, a conceptual look at the contractor's competing strategies will be undertaken. This treatment will focus on explaining the underlying rationale for their actions and reactions. An attempt will be made to draw upon Allison's work wherever possible in diagnosing their different moves or countermoves. However, although appropriate for characterizing and understanding G.E.'s strategy, Allison's paradigms provide an incomplete grid for understanding UTC/P&W's actions or underlying strategies. Therefore, a complete analysis of their actions/decisions will necessitate extending beyond the framework provided by Allison.

The decision to start the competition wheels rolling by bringing G.E. aboard, was seen as a reasonable rational move by almost everyone involved. Similarly, sparking a reaction from P&W, who had nothing to

gain and everything to lose with G.E.'s entry into the picture, was predictable. However, P&W's offensive strategy for playing the game in an environment akin to the home team's stadium, proved disastrous. Whether their approach is explainable as the by-product of a well-laid strategy or simply as the expected, almost predictable, outcome of fragmented reactionary responses to the events surrounding their challenger's march is unknown for sure.

However, as will be explored in detail throughout the next sections, UTC/P&W's strategy and decision processes cannot be completely understood through the use of Allison's models. The introduction of a more adaptive model that embodies the notion of irrational behavior is necessary to explain some of UTC/P&W's actions. As for G.E. and the Air Force, Allison's framework is sufficient to characterize the strategies and decision processes employed by these stakeholders throughout the competition. A discussion of each will be the subject of the following four sections.

B. P&W's COMPETITIVE STRATEGIES

Focusing the analysis on UTC/P&W's strategies, it becomes difficult to explain many of their actions through a classical actor lens. This may, at least in part, be attributed to a lack of consensus on their approach thereby resulting in a fragmented, often irrational or illogical approach to the issues before them. UTC/P&W's first attempt to postpone or stop the government's support for bringing the G.E. engine along by lobbying in Congress is understandable and rational. However, their decision to persist with this pseudo-political approach after having failed in their initial attempt at using this route to hold G.E. at bay, is incomprehensible from a logical viewpoint. In fact their decision to resist, in the face of growing government support, the fundamental premise of competing them(P&W) against G.E. is best seen as a decision that evolved from an inflexible flawed strategy that was set in place by those unaccustomed to the will of their customer. This unwillingness to accept the inevitable is best captured in a letter from Robert Carlson, President of P&W, to General Lew Allen, Air Force Chief of Staff, where Carlson presents his argument of inequitably on the basis of thrust disparity.

> I cannot in good conscience allow a situation which I feel is inequitable to continue unchallenged. The awards to date for competitive engines and the inability to equitably compete for the small remaining new fighter engine business in this decade severely jeopardizes the future of the world's largest critical mass of propulsion technology and manufacturing capability....and raises the real possibility that the Air Force action will forever cripple a huge national defense asset.[47]

By positioning themselves firmly against the notion of holding a competition they effectively chose to discard the mounting evidence that the government in general, and the Air Force in particular, were intent in carrying the competition forward. A rational move would have been to abandon the offensive strategy while adopting a flexible defensive approach aimed at posturing them in a favorable position for competing. Selling the attributes of their candidate engine, F100-PW-220, while working hard to construct an attractive proposal package that was responsive to the Air Force's requests would surely have put them on equal footing with G.E. at the outset.

UTC/P&W's persistence in beating the political drum throughout the competition might be explained as either an outgrowth of incorrect/ incomplete feedback about the ineffectiveness of their chosen path or belief that they could force the Air Force into retreating from their competitive charge against UTC/P&W's congressional camp. As to whether UTC's senior management were receiving incomplete or inaccurate feedback, McAbee argues otherwise: "All signals and information from our sources indicated that the Air Force was serious about competing the two engines."[5/]

If UTC/P&W's senior management believed that their approach had the greatest chance of success it represented a minority position. In fact, their approach ran counter to both external signals and advice of those within P&W who were working closely with the Air Force and knew better. Its entirely possible that UTC's management believed

that their political assault would triumph given that G.E. had been quite successful in securing funds to bring along the development of their candidate engine by lobbying in Congress. As such, UTC may have read this as a sign that a political move by their camp could be equally effective in getting the competition stopped. However, a fundamental difference is apparent in the political ploys used by the two contractors. G.E. was lobbying to gain support for a position that would give the procuring service an option and thus flexibility in an environment where rigidity had left alot of scars. They adopted a strategy aimed at providing an indirect route for bringing their engine into the picture--an alternative not just a substitute. By endorsing G.E.'s effort the Air Force gained an added degree of freedom in solving their perplexing fighter engine acquisition problem. P&W, however, chose a political approach that was doomed from the beginning. They attempted to rally support for retaining status quo in an atmosphere filled with frustration and open criticism of the sole source nature of the defense procurement business theretofore. Their unsubstantiated arguments of a "hidden agenda" fell on deaf ears and in the end were dispelled as ploys by UTC's management to retain their monopoly on the large fighter engine market.

With the evidence before UTC/P&W that the competition had nearly attained the critical mass necessary for it to proceed undaunted by their political influence, it is easy to understand their last ditch attempt to delay the inevitable by putting forth a one-time good deal offer. In fact one might view this move as the next logical step in a

structured or organized process where the outcome of the preceding move, namely their inability to stop the competition through political influence, led them to select the next step in a process aimed at delaying the competition until they could be better postured to compete. However, the way in which they administered this move suggests that they still held high regards for the power of gaining visibility and support for their cause from stakeholders that could exert pressure on the Air Force contingent intent on seeing the competition through to a formal source selection. This was evident by the indirect way in which they presented the unsolicited offer to the government--the actual proposal to the procuring service and individual letters to high officials within DOD, Executive Department and Congress. The thrust of the letter was to encourage recognition and serious consideration of their one-time offer. They weren't about to let the Air Force control their destiny if there was the slightest chance that other influential stakeholders could be persuaded to help guide the Air Force's thinking. Thus, the decision to solicit support for their proposal from those with a less parochial view than the Air Force.

> Cap, I've taken the liberty of bringing this directly to your attention...if the quest for defense savings is real, which I totally believe is the case, then it's important this offer be recognized for exactly what it is; a one-time, transitory offer that is dependent upon the quantities contained and a timely conclusion in order to enjoy the three billion dollars of savings it contains... The Air Force's plan to re-compete the procurement of F-15 and F-16 power plants as now programmed can do nothing but raise acquisition costs of both suppliers' engines. (6)

Their offer, although attractive from an economic viewpoint, would have effectively suppressed the notion of competing the fighter engine base for 5 years hence. In addition, the unsolicited proposal package contained provisos that required the Air Force to further fund the development of P&W's candidate engine, the F100-PW-220, before it could be introduced as a replacement for the existing vintage F100 engine models (-100/-200). These restrictions or limitations would later be used by those endorsing continuance of the competition as reasons for rejecting P&W's unsolicited offer. Others would argue that P&W's offer was only the "tip of the iceberg" and that their offer was the first positive sign of the true benefits of competition. Therefore, what on the surface appeared as a logical step in an organized process had little effect in altering the course of the fast moving competition train. In fact it may have done more to fuel the competition then it did to retard its progress.

The rejection of UTC/P&W's unsolicited proposal, the Air Force's decision to host a formal competitive source selection, and the public announcement by senior government officials that a dual award was the desired outcome provided a fairly clear picture of how a competitor should be positioning himself in order to capture a majority share of the fighter engine business. However, UTC/P&W's proposal strategy ran counter to that which would be anticipated from either a rational actor or organizational decision process. It was neither logical nor consistent with a model developed around the boundary conditions prescribed by the events preceding the issuance of the RFP. The

decision to put forth an "all or nothing" proposal flew in the face of what the Air Force and government officials had worked so hard at fostering. This approach defies rational explanation particularly when considering that the advice from key UTC/P&W executives discouraged adopting such a strategy. Their proposal only seemed to further enrage those senior government officials tasked with achieving an equitable solution that satisfied the objectives set forth at the outset--value maximizing and distributed industrial base. UTC/P&W's proposal all but limited the optional solution set to an adherence to a sole source procurement posture. Had this prevailed, UTC/P&W would have found themselves out of the fighter engine business since, in the end, their option was assessed as being economically inferior to G.E.'s. The Air Force's perseverance in providing and maintaining a dual source from which to choose their future fighter engines saved P&W from near term extinction in the Air Force's fighter engine market. This seemingly paradoxical decision of the Air Force in selecting an award option that was less than economically optimum in order to keep a contractor who had fought long and hard to win a battle against the Air Force says a great deal about the strength of the undercurrent which kept the competition alive for over five years.

It remains a mystery as to the reasoning behind UTC/P&W's, or more specifically Gray/Carlson's, final attempt to undo five years of competitive construction by putting forth a proposal that was aimed at returning the Air Force to a sole source procurement posture from which competition had been spawned. Possibly the belief was held by

UTC/P&W's management that contrary to the good intentions of the Air Force in attaining a dual source production base, the best "bang for the buck" would triumph in the end, regardless of the intention of a few stalwart supporters. Whatever the reasons, they chose to pursue a proposal strategy which they believed provided the Air Force with a deal that couldn't be refused. In retrospect, had there been a significant economical benefit in either contractor's 100% option the outcome may have been more aligned with what appears to have been the underlying premise upon which UTC/P&W's proposal was built. In fact, it would have been difficult, if not impossible, for the Air Force to have argued differently given that both engines were assessed as acceptable in meeting the other requirements stipulated in the RFP.

Therefore, in summary it appears as though much of UTC/P&W's initial strategy and resulting actions were the outgrowth of a politically driven but rational or organizational decision process whereas the moves and countermoves by the senior management camp within UTC/P&W took on a more fragmented, often irrational appearance, as the competition gained momentum. This seemingly irrational or incongruous behavior goes beyond that which can be explained using the conceptual framework defined by Allison.

Introducing an added dimension or "model" that encompasses an illogical non-value maximizing concept is necessary if one desires to completely explain UTC/P&W's actions using a conceptual framework. This pseudo-paradigm may help to explain the actions of those under

extreme pressure or duress; where action sometimes precedes thought, and the tunnel vision it often entrains precludes others from affecting the outcome. Such may be the explanation for UTC/P&W's senior management's decisions to persist with an offensive strategy even after it became obvious that it was destined to fail and why they also elected to put forth an "all or nothing" proposal that ran counter to the Air Force's wishes.

As described in the aforementioned treatment of UTC/P&W's strategies, much of what was put forth to their government customer was the product of a few individuals only remotely familiar with the fighter engine business and less attuned to the wants and needs, perceived or otherwise, of the Air Force. The intense pressure that Gray & Carlson must have been under coupled with a lack of knowledge about the customer and business may have served to drive them into a fighting instinct for survival. It's clear from the changes which have taken place in UTC/P&W's organizational structure, decision processes, and external relationship with their Air Force customer, that this loss served as a grim reminder of how not to do business in the future.

C. G.E.'s COMPETITIVE STRATEGIES

A closer look at G.E.'s strategy suggests that their decision to enter the fighter engine market, ultimately leading to a one-on-one competition with P&W, was the by-product of a set of unique circumstances: P&W's problems with F100, the Air Force's difficulties with P&W's management, cancellation of B-1 contract, Congress and Navy's interest in reengining the F-14B aircraft, open criticism of the defense acquisition business, particularly the sole source approach, austere budgets, and increasing pressures to reform, coming together in a 3- year period spanning 1975 to 1978.

G.E.'s principal impetus for making the investment to pursue a demonstration program was Congress' interest in reengining the F-14. "I knew if we were going to get into the large fighter engine business it would be through a reengining."[7/] Thus, G.E.'s decision to sink $15 million of their own money into a demonstration program is seen as a logical proactive move in response to a Congressional initiative. In fact as Joe Wood, Director of Acquisition for the Air Force Deputy for Propulsion, recalls: "G.E.'s demonstrator program was laid on the Air Force's table in 1975 for us to consider. It was rejected on the basis that we neither had a home nor requirement."[8/] Even without the government's financial support, G.E. launched the program with a hope that they could sell the following "prototype" development under the auspices of an insurance policy.

Building interest and momentum for the program wasn't easy. P&W seized every opportunity to stop their (G.E.'s) attempts to secure Air Force or Navy support for the program. However, their strategy of "selling" the F101X engine as an insurance policy helped win them the backing necessary to turn around P&W's success in holding them at bay. G.E.'s decision in 1978 to push forward with an engine program, that theretofore had shown great promise, was predictable and rational.

The manner in which funding was secured had much to do with convincing the right people to carry G.E.'s flag into battle. Their strategy was simple--don't tell them (customer)... but rather show them what you can do. While P&W's corporate management was out preaching to the Air Force, G.E. was putting together an impressive "show and tell" of the results from their F101X demonstration program.

To further their campaign, G.E. put some of their executives, who were highly respected within the Air Force community, on the road to talk with Air Force officials about the benefits of having G.E. enter the business. However, it wasn't all a bed of roses. G.E. worked hard to sell their case and in the end would have to use their influential power to sway General Slay and Congressman Dickinson into their camp before receiving Air Force endorsement for funding the prototype development program under the Engine Model Derivative Program budget line. Having secured a footing, there was no stopping them (G.E.) from proving what they had believed all along: "that an

economic case could be developed for replacing the existing (P&W) engine"[9/] with an engine that had overcome the perplexing problems often rationalized as being "the nature of the beast." G.E.'s moves and countermoves up to the point of contract award are both understandable and rational. Their strategy of lying low while P&W was out "shooting themselves in the foot" reflects a well-thought-out, almost intuitive, philosophy that seemed ingrained in every facet of their business: "leave well enough alone and don't interject yourself unless you have to"... much like the management philosophy espoused by Rowe & Ward.

Although their success wasn't assured, G.E. had managed to get over the largest hurdle in their run for the finish line. Things continued to fall in place for G.E., first with the impressive success of their demonstrator and prototype engine programs, followed by the Air Force's interest in determining whether the hosting of a competition might bear fruit. This was accomplished by the release of the RFI in 1981.

With the government, particularly the Air Force, carrying the flag for hosting a competition, G.E. was able to spend their resources doing that which was necessary to posture them as a viable competitor against P&W. Their strategy at building a case for competition alone was clearly evident from the beginning and captured by James N. Krebs, Vice President and General Manager of G.E.'s Military Engine Operation

during his testimony to the Senate subcommittee on Defense Appropriation:

> Competition is in the best interests of the USAF and the taxpayer... a single "winner take all" competition is not planned... The USAF plans a very equitable competition. I fail to identify why there's any reason to favor G.E. or P&W... As happens frequently in politics, the incumbent has an advantage over the challenger...10/

Krebs testimony provides a clear picture of how G.E. intended to approach the competition. To sell the idea of competition while building/supporting the case for a dual award. The Air Force's decision to run a competition could be viewed as a strategic advantage for G.E. since coming out of the competition with any share of the fighter engine business was more than they had at the outset. Their major marketing effort was focused on securing the funding necessary to bring along their candidate engine. To this end the Air Force's intentions of competing in hopes of realizing lower acquisition costs, improved warranties, and an expanded industrial base did much to garner support on G.E.'s behalf for obtaining the funds required to make G.E.'s engine a viable candidate.

Meanwhile UTC/P&W's reactions to what they perceived as Air Force favoritism of G.E. and a potential threat to them, actually helped the cause of getting the F101 DFE into the budget. UTC/P&W's more responsive demeanor and unsolicited offer to the Air Force were seen as examples of the true benefits of competition.

A critical element of G.E.'s strategy was to provide the customer with what he asked for, not necessarily what he needed, while also giving him options which contained attractive alternatives. This form of marketing was instrumental in helping G.E. sell the notion of bringing along another contractor to compete against the entrenched incumbent. It was no mistake that they were well postured to be that other contractor when the time came for the Air Force to announce their intentions of holding a formal competition. They had been true to their word in doing what the customer wanted and equally successful in putting results on the table--a winning combination when it came to obtaining governmental financial support for continuation of the development effort initiated on their own behalf in 1975.

G.E.'s proposal strategy was aligned with the Air Force's stated requirements in the RFP while also providing attractive options over those called for in the request. G.E. targeted their proposal with a recognition and acceptance of the Air Force's intentions of splitting the award. The split options were priced without bias for the award percentages other than that which would be anticipated from economies of scale. Contrary to UTC/P&W's proposal which artifically penalized the split award option by increasing warranty coverage costs, G.E.'s warranty costs were so configured to make any award split equally attractive. Their success in capturing 75% of the first year's award, equating to approximately $300M dollars of production business; probably had as much to do with UTC/P&W's unattractive split award option as it did with G.E.'s proposal. Air Force Secretary Verne Orr

espoused the significance of the warranties in the award split in stating, "the warranty issue was a key element of the competition (decision)."11/

Finally, to view G.E.'s success in capturing a majority share in the first round of the future fighter engine business, estimated to a $10 billion plus market over the next 10 years, as the sole product of a well formulated and executed strategy is to give insufficient credit to the rule of the government, particularly Congress and the Air Force, in providing the opportunity and stimulus for this fundamental change in propulsion system acquisition. Over two decades of criticism by industry and government alike of defense acquisitions, prolonged technical, supply, and managerial difficulties with their sole fighter engine contractor, and a responsive new entrant with a candidate engine which could be developed for a fraction of the cost normally required for bringing an engine to production status, provided the government and industry with a unique opportunity to make a change for the better.

Joe Wood described what he felt to be the underlying reason for the Air Force's success in recompeting the fighter engine business as, "We (government) found ourselves confronted with a unique set of circumstances due to what was occurring both internally and externally in 1977-78."12/. Without the simultaneity of these individual events it's unlikely that such a competition would have succeeded. Whether this will take its place as the model for future engine

acquisitions will depend upon whether the projected $2-3 billion savings accompanying this competition are ever realized. However, in the interim, while the jury is out awaiting the results from the early rounds, it appears that this approach will remain the "best game in town."

D. GOVERNMENTAL DECISION PROCESS

Before looking at the source selection decision process(es), it is necessary to understand or at least appreciate the internal environment around which the Air Force was striving to conduct the competition. As alluded to in prior sections, although the external conditions were right for bringing forth a competition, not everyone believed that the Air Force's decision to re-compete the fighter engine business was wise. In fact most arguments put forth ran much to the contrary. These ranged through the following assertions:

1) the competition constituted an unlevel playing field due to thrust disparities,

2) the competition would cost more than the potential savings gained in holding it,

3) insufficient test experience was available to make a decision,

4) any loss of business to G.E. would significantly impair P&W's position as a technology leader, and

5) the Air Force had already decided the winners and the issue was only one of allocation.

Together these issues/claims served to define a fairly hostile environment under which the competition advocates had to maneuver. This was particularly true when considering that many of the proponents for delaying or stopping the competition were also key stakeholders in the budget authorization decision process. And without continued budgeting support, G.E.'s engine would never have progressed to the point of becoming a candidate for competing against P&W. Thus, although both competitors were working to secure a share

of the fighter engine market, UTC/P&W, along with their government supporters, were working especially hard to stop the formal competition from materializing.

In the final analysis, it would become clear that UTC/P&W's major political assault on the Air Force's decision to compete them against G.E. would prove unsuccessful in significantly altering the course of the competition. However, when viewing the battles which ensued between the different stakeholders within the government, particularly Congress, DOD, and the Air Force, from afar it is difficult to understand how it was that the competition survived at all. Were it not for the efforts and commitment of a few key stakeholders within the Air Force, notably Secretary Orr, Assistant Secretary Cooper, General Burke, General Slay, and General Skantze, along with a handful of other Air Force staffers and program office supporters, the anti-competition contingent would likely have succeeded in their attempts to maintain status quo, equating to the retention of P&W as the sole supplier of the Air Force's fighter engines. Colonel Clarke, ASD staff officer, summarized the offensive ploy by UTC as:

> That's when their tactic was to quit trying to deal with us and start dealing with other people who could exert pressure on us. They attacked us all across the spectrum for maximum result...[13]

It resembled what one might expect of a 20th century DOD equivalent of "David and Goliath" with the Air Force, not G.E., mounting a defense against the overwhelming offensive forces of Congress and UTC. UTC left no rocks unturned; from sending letters to

the Secretary of Defense Casper Weinberger, to mustering support of key House Armed Service Committee and other Congressional members, notably Senator Lowell Weicker (Conn), Senator Christopher Dodd (Conn), Senator Lawton Chiles (FL), and Senator Joseph Addabbo (NY), etc., in attacking the basis of a competition for future fighter engines. UTC/P&W felt they had won the original competition fairly and deserved the right to retain their seat as the sole contractor.

The Air Force was repeatedly called upon to defend their decision to compete the two contractors on virtually every issue imaginable. In many instances, bills would be sponsored by P&W's congressional supporters aimed at delaying funding for further development or production release in hopes of discouraging those working to carry the competition forward. "No funds can be obligated or expended to initiate production of the alternate fighter engine."[14/] Congressman Addabbo went so far as to commission a Survey and Investigation Committee study on the AFE competition wherein the committee advocated putting a stop to the ongoing competition. Secretary Orr's much publicized response to Addabbo's letter to him highlighting the committee's findings was direct and critical.

> As I note the areas of concern in the report, I frankly am surprised to find competition among them. At a time when DOD is being publicly criticized for having insufficient competition, it should follow that this initiative to allow competition in such a significant market would be applauded.[15/]

The assaults by P&W supporters took different forms depending upon when, where, and by whom the attack was being launched. At the House

Armed Services Subcommittee meeting on the AFE competition in the early Spring of 1983, Congresswoman Patricia Schroeder (Colo) took the offensive in responding to Dr. Cooper's statement that the cost, readiness, and "program adequacy" of the competing the fighter engine business would be thoroughly reviewed by six Air Force panels in saying, "I've seen those panels before. If those guys were women, they'd all be pregnant because they can't say no to anything".[16/] Even those within the DOD questioned the Air Force's rationale for going forth with the competition. "The Air Force's competition to choose a new engine for future versions of the F-15 and F-16 fighters is running a gauntlet of critical reviews from Pentagon analysts"[17/]. Barring the general public, it wasn't difficult to find critics, some more influential than others, but nonetheless critical of the Air Force's initiative.

Congressman Richard Schulze even solicited the support of David Stockman, Director, Office of Management and Budget, in a letter to him expressing concern over the Air Force's apparent non-responsiveness to P&W's unsolicited offer. Stockman, however, had enough foresight to turn the matter over to Air Force Secretary Orr rather than interjecting himself into the mounting stream of opposition. Probably the best statement that captures the environment which surrounded the competition for over a year was provided by David Smith, "In any case, this program is highly political and will not be decided by the Air Force alone."[18/] UTC/P&W's lobbying wasn't limited to Washington D.C., but took a home town decor when Robert

Carlson hosted a fund raiser for the Chairman of the House Defense Appropriation Subcommittee on 22 Sept 1983.

As if the external pressure wasn't enough, the Air Force was beginning to become under attack from within the Department of Defense. Adm. Isham Linder, Director of Test & Evaluation in the Office of the Secretary of Defense (OSD), after receiving a briefing on the status of qualification testing for the two candidate engines, wrote a letter to high level Air Force and OSD personnel proclaiming that to proceed with the competition was unwise since neither engine was currently qualified. He argued that the Air Force should delay the competition until such time that both engines had completed the required qualification testing. As a fallout of this letter, the Defense Systems Acquisition Review Council (DSARC) commissioned a study of the cost implications of competitive procurement for future fighter engines by the Cost Analysis Improvement Group (CAIG) under the direction of Deputy Director Milton Margolis. The CAIG's report was critical of the life-cycle cost analysis conducted by the Air Force team charged with evaluating the merits of holding a competition. However, other than providing a temporary diversion from the business at hand the arguments put forth by Linder & Margolis were "resolved" without significantly alternating the course of the ongoing competition. These overt efforts to derail the competition train seemed to further entrench those who were behind seeing the competition through to its logical outcome.

With the environment characterized as being anything but supportive of the Air Force's plight, no reasonable explanation, other than the strength, commitment, and perseverance of a few can be given for the survival of the competition. It is unlikely that an aggregate analysis would find but little rational justification for the Air Force's success in fending off the formidable challenge posed by such a powerful political contingent.

The award announcement giving the challenger, G.E., a major share of the business, came as little surprise to those familiar with the proposals. But, had G.E. won the war, or was it simply that P&W had lost. A rational actor would argue the former whereas the facts in the case suggest that the outcome was a by-product of the Air Force's quest to provide a stage upon which G.E. and P&W could perform. The fact that G.E. came out on top is as much P&W's doing as it was their own. An analysis of key events would indicate that in the end UTC/P&W's offensive strategy did more to help the cause of bringing the competition into the foreground, thereby giving their competitor an opportunity to act out his part, than it did in closing the curtains on competition.

Looking at the AFE competitive selection decision process one immediately questions whether the unexplained survival of the Air Force's competition was an outgrowth of the implicit and explicit organizational elements inherent in the process. Little can be gleaned from analyzing the events leading up to the competition using

the Model II framework. However, the actual conduct of the source selection, beginning with the issuance of the RFP, through to contract award fits nicely with Model II patterns. The interactions and resulting outcomes of the various clashes between the major stakeholders can be partially, if not totally, explained by the proportion of shares held by each stakeholder and the untouchable rules of the game.

Thus, when viewing the altercations in a Model II light one can understand and even predict the outcomes. One of the unwritten but much adhered to rules in inter-governmental inquiries is that the principal command has the responsibility for putting the issue to bed. In essence, this means doing whatever is necessary to satisfy the organization or individual challenging the chosen course of action. As one might expect, little in the business of defense acquisitions is black and white, and more importantly, if a service is committed to making something happen, they are likely to succeed. As to the selection process, once an official source selection is underway, barring a major funding crisis or major misconduct by the command charged with performing the evaluation, it is likely to run its natural course through to completion. The process is "off limits" to outsiders and remains the responsibility of the procuring service up to the point of contract award.

At this stage the results of the Source Selection and rationale for the decision are open for scrutiny by OSD, Congress, and the

general public. This standard operating procedure of sequestering the actual selection process was an important barrier to entry which kept the selection train rolling down the tracks. Recognizing that the selection process itself represents a set of Standard Operation Procedures amassed to yield a decision, any challenge becomes principally a matter of record with the challenger, typically a losing contractor's Congressman, being accepted by his contingent as putting forth the "old college try." It is no wonder that even with the attacks from outside and within the Defense Department, that once started the process was able to proceed to its logical conclusion.

E. SUMMARY

To recap, Model II provides a plausible explanation for the otherwise unexplainable survival of the competition. Correspondingly, the Model I concepts proved effective in rationalizing the events leading up to the competition while also serving to explain both G.E's strategy and the eventual outcome. What is least understood about the AFE story is why P&W persisted with their attack on the Air Force, apparently knowing full well that their offensive front would only serve to further entrench those closest to the competition while also serving to allienate many of their original supporters and those within their own camp (company) that saw the proverbial "writing on the wall".

Allison's Governmental Politics Model (Model III) shed some light on those issues previously unanswered by either Model I or Model II. UTC/P&W's actions of sending personal letters to Congress, DOD, and Executive Office personnel appealing for early termination of the, soon to be formal, competition by accepting P&W's attractive offer was purely political in nature. UTC's ploy of pitting OSD, Congress, and themselves against the competition was also in line with the political decision process. What they were late in realizing was that the Air Force was committed, maybe infatuated, with the notion of competition and was predisposed to seeing it through to completion. By attacking competition, P&W was not only making a direct assault on the Air

Force, but also public sentiment about the defense procurement business.

As the record shows, it proved to be a costly mistake. Their quest to destroy their surrogate competitor rather than to defend their own territory (product) was an error in their competitive strategy. The failure to alter the process through political influence later served as a grim reminder of how not to deal with a major customer. Had the competition occurred 20 years earlier, or had the public not indirectly proclaimed their support for the Air Force's initiative, P&W may have been successful in their endeavor to kill the competition through political influence.

The Secretary's decision of a 75%-25% contract award rather than giving 100% to G.E. is unexplainable by either Model I or II. Both paradigms would support a 100% award to G.E., given that they had the best "bang for the buck". The implicit signal the Secretary was attempting to convey to P&W was that although you "lost the battle you have yet to lose the war." A 100% award would have relayed the message that their proposal was unquestionably inferior. A partial award, recognizing the premium the U.S. Air Force would have to pay for the P&W engines under anything other than 100% award, would convey a message that "if you want to be in this the next round you had better clean up your act and play by our rules." As history shows, the Secretary's strategy, albeit not completely his own, was quite effective in getting P&W to stand up and take notice.

To view the entire process rather than just selected elements of the competition using Model III spectacles provides an interesting and plausible explanation for the award decision. As discussed in the preceding paragraphs the award split and P&W's strategy for going after the competition fit nicely within the political paradigm conceptual framework. However, a true proponent of the political model might argue that the competition from inception to contract award was a direct consequence of political decisions aimed at (1) punishing P&W for their recalcitrant behavior in dealing with the Air Force, and (2) being the first defense service to actively promote competition among defense contractors in an environment where austerity programs won you praise from Capitol Hill.

People close to the competition actually believed that had P&W employed a more customer oriented approach in the early conceptual days of the competition instead of intentionally circumventing the Air Force by lobbying in Washington D.C. while lambasting them publicly and privately, the formal competition would never have materialized. In fact, an individual close to the source during UTC's/P&W's most intense attack on the competition commented that:

> UTC's corporate headquarters was P&W's worst enemy. They were relentless in their attacks but often misinformed of the facts. Their strategy of working around, rather than through the Air Force's chain of command was a critical error in judgment.[19]

It appears that Gray, realizing only too late that their approach was malignant and destined to destroy what little remained of UTC's

relationship with their Air Force customer, not to mention the damage inflicted internally, set out to indirectly soothe the wounds by publicly espousing some profound words of wisdom:

> **Don't Be Sorry You Said It...** Sometimes you may blurt out something you really don't mean. But words once spoken, like bullets once fired, can't be recalled. And they can wound. Before you say something needlessly hurtful, calm down. Count to ten. Speak with reason, not just emotion. You may want to tear up that letter instead of sending it. Reflect before you sound off. Give the urge to blast a chance to pass. Otherwise you may say something you'll regret always.[20]

To say that the final contract award decision was political in nature is to overstate the importance of politics in the selection process. However, to state that the survival of the competition was the outgrowth of a process wherein politics played a major role is a reasonable assertion.

When viewing the acquisition process from afar it is easy to conclude that with the environment right for competition; born out of 15 years of criticism against the sole source process, the Air Force's dissatisfaction with P&W, and the need for a much improved engine to power the Air Force's tactical fighters into the 90s, the AFE competition was the only logical course to follow. However, as detailed in prior sections, the actual course that the competition followed was influenced at different stages by various stakeholders. As to which events, decisions, or individuals were most important to the final outcome can only be speculated from a postmortem analysis of the process. One thing is clear; to attempt explaining the process

from the pre-competition period through to contract award using a single set of lenses is futile.

Although the Classical Model (Model I) contributes much to the understanding of the process flow and decision, it does not serve to explain some of the key events that have come to be considered instrumental in keeping the competition alive. For those we needed to turn to Model II and Model III. Model II's conceptual framework does well to explain why, once the formal Source Selection was underway, the process was able to continue through to contract award. Model III's contribution towards understanding the process and outcome takes different forms depending upon how one views the political role in the decision-making process. It appears reasonable in hindsight to attribute the overall survival of the competition to the political influence of certain key stakeholders. As to their motivation for fighting the battle against what, at the time, appeared to be insurmountable odds, is a subject for future research. Whether Model III is appropriate for explaining how the initial seed was planted that eventually blossomed into a formal competition is not clear, but one need not look far for circumstantial evidence to support this view. Air Force Colonel Robert W. Drewes succinctly summed up this view in stating:

> The engine competition is foremost a tribute to the strong character of a small core group of public servants...all similarly bound by an aggressive determination to get a better engine and responsive service...Vision and perseverance by a committed few are primarily responsible for this achievement...No one could have anticipated or arranged the fortuitous confluence of events that made the competition possible.[21]

Finally, UTC's decision to take on the Air Force generates more questions than it answers and cannot be understood as a logical rational course of action. Had they possessed the foresight to realize the likely consequences of such a strategy the outcome may have been quite different.

In all, the decision to compete, formulation and execution of a competitive process, and the resulting contract award decision cannot be explained by any one or combination of Allison's three models. As Allison alluded to in his book, there exists "the possibility of a grand model that would incorporate the features of all."[22/] He goes on to say that "A number of scholars whom our analytic chapters have squeezed into a single box display considerable intuitive powers in blending insights from all three models."[23/] Such appears to be a necessary prerequisite for analyzing the Great Engine War. However, even an all encompassing model that contains within it the active features of Allison's paradigms is insufficient for explaining the survival and outcome of the competition. One must look outside of the domain bounded by these models to find the circuitous path through this intertwined jungle of political, rational, organizational, and emotional events.

CHAPTER 4

CONCLUSIONS

A. AFE COMPETITION

It's unlikely that but a few historical accounts of defense acquisitions will pay tribute to the Air Force for their success in resurrecting competition in defense procurements. Nor are they likely to describe the AFE competition as the catalyst that brought about the beginning of the ongoing reformation in defense acquisition policies and practices. Yet, few will miss the opportunity to comment on the untold costs that may arise in managing and administrating the resulting production contract so as to conform to the new legislation being passed by Congress. However, much can and should be gleaned by industry and government from the AFE competition, particularly those features that serve to distinguish it from other procurements.

Only after taking an in-depth look at the events, strategies, structures, and results can one truely appreciate the importance of knowing your customer, specifically how he thinks and acts, when positioning yourself to obtain or retain his business. Although a prerequisite to retention, success in capturing the initial business doesn't automatically guarantee retaining it. The AFE competition serves as a testimony to the need for continually placing emphasis on

giving the customer what he wants, when he wants it. Had UTC/P&W worked harder in retaining the business during the early days preceding the competition, they may not have found themselves working to recapture that which they had lost.

The "Great Engine War" stands as a classical example of how a company's strategies and functional structure can do as much to lose the business as another company's can in capturing it. Clearly, both played a critical role in G.E.'s and P&W's bids for the Air Force's fighter engine business. In looking back over the events that describe the AFE competition, it is possible to ascertain the "cause and effect" of each stakeholder's strategies and resulting actions in nurturing the unprecedented competition that would come to be acclaimed as a major benchmark in propulsion acquisition. The importance of understanding why certain strategies worked while others failed is paramount to those looking to retain or regain defense business with the U.S. government. Without too much extrapolation, it is possible to see the more generic lessons on how to approach doing business with any customer.

P&W's recent success in securing defense contracts pays tribute to their ability to quickly learn from past mistakes by making the changes necessary to reestablish their credibility and regain DOD's endorsement. Their strong revival will benefit both themselves and the government. It is unlikely that a reversion to the strategies and mode of operation that did as much to lose the competition as did

G.E.'s to win it, will occur as long as they continue to thrive in defense business.

As for G.E., little needs to be said other than "when you have a good thing stick with it." Emulation of their strategies and structure, as P&W has found, will likely prove a winning combination for those looking to do business with the government.

Although the AFE competition may not go into the archives of defense acquisition as some believe it should, it will undoubtedly be remembered by those in the business as a major benchmark in propulsion system acquisition; where it has had a pronounced positive effect on the business ever since. Some of the major lessons learned relative to strategy and structure are detailed in the following paragraphs.

Industry --- Internal

Innovation and risk taking are prerequisites to succeeding in business. Had G.E. not taken the initial risk by investing $15M of their money to start a demonstrator program, there would never have been an Alternate Fighter Engine. Their ability to get Congress and Air Force support for continuing the development effort can be directly linked to this investment decision. Without the concrete test results showing that the problems plaguing the F100 could be overcome, it is unlikely that either Congress or the Air Force would have worked to secure funding for the program. Equally important was

the innovative manner in which they positioned themselves to attract and hold the Air Force's support. By marketing their engine as an insurance policy and a lever to "entice" P&W to take their customer's concerns more seriously, G.E. was able to gain quick acceptance by Congress and the Air Force. Had they employed a push rather than pull strategy, it is questionable whether the Air Force would have bought in to the development program; particularly in light of the internal resistance to funding G.E.'s development effort in the early days of the competition. Even UTC/P&W interpreted the Air Force's early endorsement as a signal that they (A.F.) were only doing it to get their (P&W's) attention and that they would never really consider competing the two contractors. A little more innovation on behalf of P&W in responding to this early signal might have saved them from a head-to-head competition five years later.

P&W's recent success in capturing business in new markets, while also receiving a majority share of the recent AFF contract award, is a reflection of their commitment to taking more risks. With competitors vying to capture or take away the reduced level of business that now accompanies higher cost systems, innovation will play a major role for those hoping to hold onto or expand their share in these dwindling markets. As to future markets, it is already clear that G.E.'s decision to take the financial risk to launch a major new innovation in propulsion, i.e., unducted fan (UDF), will give them a one to two year monopoly position in what should be an extremely lucrative market.

There is no room for complacency in a successful endeavor. Complacency, or the appearance thereof, on the part of UTC/P&W took its toll in the early days of the competition. Had the Air Force believed that UTC/P&W was seriously working to fix the ailing F100 engine, it is unlikely that they would have joined Congress in bringing G.E. into the picture. In fact, the decision to support G.E.'s development effort stemmed from the Air Force's desire to light a fire under UTC/P&W management in responding to their concerns. UTC/P&W's senior management's belief that the Air Force could never get enough support or would be able to economically justify putting the G.E. engine into production only helped fuel the fire for bringing G.E. aboard. Their approach of only doing that which the customer had paid for, regardless of whether it served to drag out the time it took to incorporate a much needed fix, was a sign of this false belief that they harbored. As inferred from the outcome, this was a critical error in judgment that would hurt them to this day. Had P&W set aside the notion that the Air Force was only bluffing and stepped up to address their customer's concerns, much of the impetus for bringing along the G.E. engine would have disappeared.

Listen to those within the company that know the business and customer; particularly when formulating strategies for capturing and retaining business. UTC/P&W's mistargeted strategy can be traced directly to senior management's unwillingness to listen and act upon the advise of those within the company who knew the business and customer. Had Carlson and Gray followed the advice of their managers,

they would likely have succeeded in capturing a larger share of the business. Contrary to UTC/P&W, G.E.'s senior management took maximum advantage of the knowledge and talent of those within the company that were close to the business. Their (G.E.) competitive and proposal strategies were formulated by those at the bottom of the organization, not at the top. UTC/P&W chose to do otherwise and failed in their attempt. The fact that P&W has changed their approach, placing more responsibility on those closer to the customer, is a sign that they realized the importance of having people who know the business "call the shots."

A corollary lesson to listening is, **don't assert your influence on a program or project if unfamiliar with the business.** By inserting themselves into, an area of business that they were not that familiar with, Gray and Carlson did more harm than good. Once things began to heat up, it was virtually impossible for them to disengage. As such, they found themselves having to make both strategic and tactical decisions in a business and environment that was somewhat foreign to them. This factor, coupled with their unwillingness to listen and act upon the advice of others in the company, proved disastrous. Had they left the decisions which had to be made to those closer to the business and customer, P&W would have fared much better in their plight to retain a majority of the large fighter engine business. In view of how things progressed in the early stages of the competition, P&W might even have maintained a monopoly position had senior management not eschewed their manager's advice.

A further corollary to the earlier lesson is to, **provide autonomy to those within the organization responsible for a program or project.** When contrasting G.E.'s and P&W's decision-making process, it is easy to deduce which process was the most effective in putting across a consistent unified position to the customer. The degree of flexibility afforded by a more autonomous management style allowed those close to the customer to make the decisions with a minimum of oversight or intervention by senior management. Had UTC/P&W's senior management adopted a more autonomous style, many of the issues which corporate management personally took charge in "solving" by working around their customer, would never have gotten the visibility or had the impact of further entrenching those in the government intent on bringing a more responsive contractor aboard. P&W's project management, having been left to their own devices, could have prevented many of the minor skirmishes from turning into major battles. The management style being practiced today at UTC/P&W reflects a recognition of the importance for having those responsible for a project manage it.

Industry -- External

Market the attributes of your product rather than attempting to denigrate your competitor's product. UTC/P&W's offensive strategy contributed more to drawing attention and support for G.E.'s engine than any other single factor. Their rebuttal of the claims being made about the G.E. engine had the opposite effect to that intended. The

Air Force and Congress viewed UTC/P&W's reaction as a positive indication that competition would get P&W to stand up and take notice of the Air Force's resolve to get their problems addressed. Their ploy also drew attention to G.E.'s engine and was interpreted by many as a sign that G.E. had a product worthy of note. Also, UTC/P&W's offensive assault had a further negative effect relative to their relationship with the Air Force. By attacking the claims, they were indirectly stating that they did not trust the Air Force in providing a clear picture to DOD or Congress. This move infuriated Air Force officials and helped G.E. in their efforts to get further visibility and support for competing the Air Force's fighter engine business. G.E.'s approach of marketing the attributes of their engine, particularly those which their competitor's product lacked, proved infallible in gaining recognition and support for developing and qualifying an alternate fighter engine. It is not surprising to see that P&W's marketing strategy has changed dramatically since the award announcement in February 1983.

Their recent success in capturing demonstration and development contracts is a testimony to the rewards possible when marketing the attributes of your own product rather than attacking a competitors.

Never underestimate the power of your customer in accomplishing the unthinkable. Clearly, UTC/P&W senior management never anticipated that the Air Force would be able to pull it (competition) off. This belief served to guide them in the development of a

strategy aimed a "convincing" their customer and those around him that it was impractical to consider recompeting the fighter engine production business. Even after the competition attained the critical mass necessary to carry it forward, UTC/P&W senior management would not accept that the Air Force could possibly succeed in justifying a split award. As such, they structured a proposal which, in their view, left the Air Force no choice but to award them 100% of the business. Had they accepted the possibility that their customer might succeed in splitting the fighter engine business, it is entirely likely that their strategy would have reflected a more responsive competitive approach resulting in the award of a larger share of the production contract.

Give your customer what he has asked for, not necessarily what you believe he needs. After helping to plant the seed for competing the fighter engine business, G.E. quickly adopted a strategy of giving the Air Force what they wanted, while UTC/P&W persisted with their attempts at persuading them that recompeting was irresponsible and a waste of the taxpayer's money. This is not to say that the contractors did not play a part in the formulation of the Air Force's objectives or goals. In fact, G.E. deserves credit for their role in helping shape the government's initial case for pursuing an alternate engine.

Similarly, UTC/P&W's reactive response served to further strengthen the Air Force's position that a competitive threat would

yield both intangible as well as tangible benefits. Had UTC/P&W acquiesced and worked with, rather than against, the Air Force, they would have undoubtably faired better in the end. UTC/P&W's belief that the Air Force would ultimately set aside their implicit intention of splitting the award in favor of an attractive 100% option almost resulted in P&W being closed out of the large fighter engine business.

The notion of being responsive to your customer's wishes can be further generalized and restated as, **listen to your customer and develop a strategy that serves to position you in a favorable light.** G.E. did exactly that, by putting together an attractive bundle that was responsive to the Air Force's needs. Their approach of marketing the F110 as an insurance policy while demonstrating that it exhibited many of the desired attributes which the F100 lacked put them in good stead with the Air Force community. G.E. developed a strategy that effectively capitalized on the Air Force's dissatisfaction with the lack of flexibility available to them in solving their fighter engine problems. UTC/P&W's strategy of putting the Air Force on the defensive through accusations of a hidden agenda and preordained decisions reflected their unwillingness to accept what the Air Force was saying. By positioning themselves opposite the Air Force, UTC/P&W lost much of their governmental support, the consequences of which became obvious as the "war" intensified. Had they listened and reacted based upon what they heard rather than what they believed, UTC/P&W would have been viewed in a more favorable light by those deciding where to place the business.

Finally, the last major lesson for industry that can be derived from the AFE competition deals with trust. **When issues arise, negotiate directly with the customer in attempting to arrive at a settlement.** UTC/P&W's attempts at influencing the Air Force by exerting pressure through other stakeholders, notably DOD and Congress, served to destroy UTC/P&W's credibility with their customer. The decision to work around rather than through the Air Force in getting their views heard signified their lack of trust in the Air Force. This situation served to further exacerbate the existing problems while putting the Air Force on the defensive. UTC/P&W's strategy of indirectly attacking the Air Force infuriated many senior officials who had been working hard to assure UTC/P&W that the competition was fair and would be decided exclusively upon the explicitly defined criteria. The result was a further entrenchment of those working to see the competition through to a natural conclusion.

Government

The lessons for government come in the form of strategies for carrying out a new initiative and the benefits of maintaining competition in defense acquisitions. As to strategy, **keep everything aboveboard and respond to challengers in a positive manner with a consistent supportable position.** The success of the Air Force in keeping the competition alive is directly attributable to their consistent approach and arguments for recompeting the fighter engine business. Numerous attempts were made at derailing the competition

train through assertions or claims that the Air Force had ulterior motives for competing.

Yet, the Air Force was not dissuaded by these unsupported arguments and persisted with a consistent rational set of reasons for their initiative. They never resorted to mudslinging to counter the arguments being espoused by those attempting to slow or stop the competition. Rather, they built a solid comprehensive case around the facts and concentrated their effort on selling it to the other constituents. Had they adopted a reactionary, rather than actionary, modus operandi, the resulting dispersion or fragmentation of effort may have stalled the competitive drive.

As it was, the concentration of resources, focused on presenting a united front, was instrumental in keeping the competition alive and in good health. In tackling the hard issues head-on while building and putting forth a strong case for their move to re-compete the fighter engine business, the Air Force was able to sway others to join their camp. Those who were initially skeptical of the Air Force's stated intentions became proponents after becoming convinced, through the Air Force's forthright approach, that they were on the right track. Had the Air Force showed signs of inconsistency or contradiction in their approach or rationale for recompeting the production business, UTC/P&W's contingency may have succeeded in getting DOD or Congress to put a hault to the Air Force's drive.

As to maintaining competition, the outcome of the "Great Engine War" provides a strong argument for **carrying competition as far into a system's acquisition life cycle as is realistically feasible.** The benefits of sustaining competition into the production phase and aftermarket are clearly evident from the results of the AFE competition. As noted earlier, the intangible benefits can be as significant as the tangible rewards of competitive procurements. The Air Force emerged from the "war" with more durable, reliable, economically attractive engines than theretofore.

In addition, the Air Force got the attention of UTC/P&W and have since retained it. The intransigent unresponsive contractor of yesterday has rightfully earned the respect and admiration of his government customer through a major metamorphosis of his strategies and structure. This intangible benefit alone may have been worth the expense and effort required to bring the AFE competition to the forefront of defense acquisitions.

Overall

Probably the most significant and far-reaching lesson that can be gleaned from the AFE competition involves people and their importance to the success of any venture. Without the dedication and perseverance of a few, the "Great Engine War" would never have come to pass . . . as least not bearing the positive overtones so often associated with a successful initiative. Therefore, the lesson is

simply that intelligent and committed people can endure and eventually triumph against the greatest odds. Such was the case in the "Great Engine War".

> Unintimidated undaunted smart people can solve or avoid the most desperate of problems. The key ingredients for success are committed leadership, resourceful staff, and tenacious workers in the trenches.[1/]

Finally, as detailed in Chapter 3, most of the strategic and tactical decisions embodied within the AFE competition can be described as conforming to one or more of Allison's conceptual paradigms. G.E.'s strategy and resulting decisions are readily explained using Models I and III. Also, the government's decision processes and actions can be adequately treated through the framework provided by Allison. However, understanding UTC/P&W's strategies and behavior required moving beyond the conceptual grid defined by Allison. Although many of their early actions and decisions fit nicely within the conceptual arena established by the three models, their decision to persist with an offensive strategy, particularly one aimed at attacking the Air Force, well beyond the point where its ineffectiveness became apparent cannot be properly treated without extending outside Allison's conceptual framework. Similarly, UTC/P&W's decision to put forth an "all or nothing" proposal that made a split decision economically unattractive is unexplainable using Allison's lens.

For these we needed to accept the possibility of an irrational "model" or actor wherein the decision or actions are derived from an illogical or non-optimizing process. Attempting to thoroughly characterize this pseudo-paradigm would be futile since to do so predisposes that incongruous or irrational behavior can be treated in something other than a general context. However, the mere acceptance that humans can, at times, function and act in a manner which cannot be ascribed as logical, provides the necessary basis for attempting to "comprehend" UTC/P&W's senior management's behavior.

As suggested in the earlier conceptual analysis of UTC/P&W's strategies, this irrational "model" may only be active when the constituents are under extreme pressure or duress and unable to function in a totally rational manner. It would appear that such a situation existed in the latter days of the competition. Gray & Carlson were likely under intense pressure by their board of directors, shareholders, and community to hold onto the Air Force's business. However, as they faulted in their earlier, more rational, attempts at doing so, the pressure and criticism may have driven them into adopting a more parochial, less rational, approach.

At this stage, their behavior appears to have been more instinctively guided rather than rational, with the perceived alternatives being limited to either continuing the fight or fleeing. It is clear as to which path they chose. Had they stepped back and let those in the trenches take charge of formulating and executing the

competitive strategies, they may have found that a third alternative, namely, coexisting and sharing the business while still retaining a majority share was possible. As it turned out they almost got themselves run off of the field, settling with a minority share of the business.

B. OUTLOOK ON DEFENSE ACQUISITION AND THE INDUSTRIAL BASE

Although it is too early to assess the impact to defense acquisition of the changes spawned by the AFE competition, it is possible to view the general trends as an indication of where the business is headed. An objective assessment of the likely consequences of these changes on the defense industrial base, via an analysis of current events and established trends/patterns, is possible and the subject of this section.

As portrayed in the preceding chapters, the AFE competition served as the catalyst for the movement into a new era of defense acquisition. Why it has taken over two decades to begin the return to a process that has been symbolic of the free market system is difficult to understand, particularly when virtually every stakeholder associated with the process has been advocating change. Gansler glibly attributes the problem to the "dominant role played by the federal government."[2/] He assails the government's day-to-day involvement in the operations of the firms on the grounds that it further removes the defense business from operating as a traditional market.

The AFE competition has done much to address some of the issues put forth by Gansler, Fox, and others. Their criticisms on the conduct of the market, particularly buy-ins, sole-sourcing, production contracts tied to development contract awards, lack of market-sharing

and the like are inappropriate when viewing the structure and processes surrounding the AFE competition.

Similarly, numerous formal changes to defense procurement regulations, Title 48, Chapter 2 in the Code of Federal Regulations (CFR) have been passed in the past few years addressing many of the changes advocated by defense acquisition critics. However, not all of the changes being implemented are viewed as responding to the challenge of improving the defense acquisition business. In fact, some appear to be working counter to the problems for which they were intended to solve. A closer look at the nature and extent of the sweeping revisions (see Appendix 1 for synopsis of recent legislation and initiatives) to defense procurement legislation suggests that a moratorium on change is necessary if we are to get an idea of their impact. Only when the system attains a steady state condition will it be possible to adequately assess the effect of these recent actions.

The ink has hardly dried on a piece of work criticizing the defense procurement business before another critique is underway. Do these studies and ensuing reports capture distinctively different "weaknesses" while advocating unique solutions to the problems ailing the defense acquisition business, or do they represent a collection of like stories, distinguishable only by the style and manner in which they are presented? The latter is clearly the case. One is quickly befuddled when attempting to understand why such vast, but similar accounts, have until recently, had little impact on the defense

business. An understanding comes with the realization that in an environment where the key players are constantly changing it's virtually impossible to make broad sweeping changes.

> The system can't be changed with a large force over a short period of time because of the level of resistance. Changes must come about through evolution, not revolution. Washingtonians are not prepared to handle a revolution.[3]

Therefore, it is not surprising to find that many of the changes being proposed and enacted today are simply recapitulations of those which have been recommended over the past 20 years.

As highlighted in Chapters 1 and 2, maintaining competition into the production phase has long been touted as the most effective way to control costs of weapon systems. Similarly, prototyping, as a means for arriving at realistic estimates of actual costs while demonstrating new technologies has appeared in nearly every report/case study on defense acquisition practices since the mid-1960s.

> "If possible, contracts should be issued to two or more contractors to build test prototypes proving out their concepts."[4]

> "Spending more on experimental prototype demonstrations of new technology can yield highly leveraged, multifold savings..."[5]

> "We recommend a high priority on building and testing prototype systems to demonstrate new technology... and to provide a basis for realistic cost estimates."[6]

Until recently, both approaches, sustained competition and prototyping, enjoyed only marginal success. Yet, in less than five

years both have come to be recognized as prudent ways of conducting defense acquisitions.

It now appears that the tables are turning such that these approaches, particularly competitive procurement, are beginning to be abused through indiscriminate use rather than as they were intended. McAbee believes that "If we let it (competition) go too far, it will likely have a net negative effect."[7/]

As to sustaining competition into the production phase to the point where it entails giving technology to a competitor so that he can manufacture your product, e.g., G.E.'s F404 engine production by P&W, McAbee argues

> I don't think we will ever get close to G.E. in terms of cost... it's reasonable to assume that Congress will wise up and recognize that in this case it doesn't make sense to compete.[8/]

Many view that the government's voracious appetite for reducing costs through competition is likely to have the opposite effect. The increase in pressure to indiscriminately establish competition at the subcontractor levels is likely to end up costing the government more. With the prime contractors in competition with one another they will bring on a second source if it appears economically attractive.

> It (competition) doesn't make sense in many cases where the quantity is low and the costs to bring on other sources high... We need a good economic model to help determine where it makes sense to compete... Today the decision to compete is more emotionally driven than it is by economics.[9/]

The move by the Navy to maintain two production sources for the F404 engine may represent an example of where the government has moved beyond the point of reasonableness. It is a step toward "socializing the defense business... where the incentive for the original manufacturer to incorporate new technology is destroyed."[10/]

Although most agree that competition is good and a must for a country our size, a judicious choice of when and where to use it is equally important. The potential benefits of competition are being misconstrued by those in authoritative positions within the government when "they enact a law that requires competition on 50% of the contracts awarded by a service regardless of whether it can be shown to be economically attractive or not".[11/]

These views on how the government is responding to the competitive initiative bear a common theme--form is being placed above essence. O'Connor endorses competition but feels that more emphasis is required on administering it properly. "Government needs to back off of managing the process as though it was sole source if competition is to function as it was designed."[12/] Attention to the substantive ingredients of a sound competition rather than candidly mandating a doctrine of competing for the sake of competition should serve as a governing equation in the government's business dealings with industry.

Gansler's comprehensive treatment of the defense industry captures many of the perceived problems with the defense acquisition business.

He cites numerous factors not the least of which are the structure of the defense industry, lack of competition in production, lack of multi-year funding, disregard for lower tier suppliers, governmental micro-managing, excessive regulations, unduly specialized specifications, cyclic nature of the business, and contract award criteria, to name only a few. His proposed solutions, although tending to be broad in nature, parallel the shortcomings highlighted above. It is interesting to note that much of what is going on today in the defense business cuts across many of the alternatives proposed by Gansler. With his recent participation, as an advisor, in the Blue Ribbon Commission on Defense Acquisition, it's not surprising that the current wave of changes being ushered through Congress and DOD bear a Gansler motif.

The future impact of the changes brought about by these explicit formal recommendations e.g., Carlucci Initiatives, Packard Commission, Goldwater-Nichols Reorganization Act, or as an outgrowth of the reactions to the events that have come about in the defense industry over the past five years is ambiguous at best. Part of the reason for the ambiguity stems from a lack of foresight in establishing which regulations are likely to stay and which are to go. The government, like industry, is operating on uncharted waters. Never before have they asked so much from industry while promising so little. The significance of their actions, particularly those in which they have little or no prior experience will only come with time. Whether potentially destructive endeavors will be discovered with sufficient

lead time to alter their outcome is a question that has been asked more than once. However, there are certain trends that are viewed by most as counter-productive or even potentially hazardous to the overall health of the industry. The following paragraphs will detail some of these areas and the concerns which surround them.

The benefits and perceived limitations of competitive procurement, as being applied by the Air Force and Navy, were described earlier. What was lacking from this treatment of competition is the way in which the services are now approaching industry with defense contracts. Aspects of defense business that once make it attractive are being systematically eliminated. The slight profit once enjoyed by industry on defense R&D business has turned into a major capital investment, via cost sharing arrangements under a firm fixed price (FFP) contract umbrella. The assurance of capturing a sustained revenue and corresponding profit stream from the ensuing production contract when earlier awarded the R&D contract has been transformed into the strong likelihood of a shared production contract, if any at all. Even with these attendant risks the government has retained the right, by statute, to limit the amount of profit that competing companies can make on a given government contract.

Thus, unlike an efficient securities market where high returns accompany high risk, current investments in defense business provide little assurance of like returns. To minimize an individual firm's exposure, the government has encouraged, and in some cases required,

teaming between otherwise competing firms. Companies are finding themselves in precarious situations, where on one hand they are teaming and thus sharing technology with another company while in direct competition with their teammate on another contract, i.e., Boeing-Vertol joint venture with Bell on U.S. Marine Corps' V-22 contract while competing against Bell on Army's LHX program . Even when a piece of the production contract is assured, which it seldom is, the requirement exists for the contractor to breakout the spares such that the government can go direct to the second tier suppliers, eliminating the primes' commission, yet retaining the right to call upon the prime to stand behind the spares through a comprehensive warranty. Where is industry and the government likely to find themselves? "You're likely to see more companies unwilling to bid... defense business is becoming relatively unattractive."[13/]

The current move by the government, especially the Air Force, to require industry to make extensive capital investments, estimated by industry experts at approximately $1 billion[14/] on the Advanced Tactical Fighter (ATF), will likely "blunt industry's ability to invent anything new."[15/] Companies aren't likely to take the higher risks which accompany major technological advancements if they are operating under a firm fixed price (FFP) cost sharing arrangement with the government. "Not too many companies are likely to take a big financial bath and come out with zest and zeal relative to reentering another contract with the government."[16/] As Rowe succinctly describes it:

> Companies will stay in as long as they can make a reasonable return. They will take a lot of shit but when it looks as though they can't make the return some will say the hell with it."[17]

Interestingly enough, industry is not alone in their criticism of the government's "new deal".

> Is it the right way of doing business?... my answer is no'.... we're asking industry to share more of the risk than appears justified... we ought to be willing to pay for what we want."[18]

However, General Skantze, AFSC Commander, cautions that: "Shouldn't take the ATF itself, in the way we structured that contract, as an example of the way we necessarily intend to do business in the future.[19]

Some in industry view the government-industry relationship as one-sided.

> We have to perform to the letter of the contract yet the government has no requirement to adhere to their commitments, particularly the time scale in which they will exercise their options.[20]

Their cause for concern appears justified when one looks at the Army's move to delay the development decision of the LHX helicopter by over a year. A move of this sort, after industry has sunk their own money into getting the effort started, can easily turn a positive Net Present Value (NPV) proposition into a bad investment. It would appear as though the government has finally succeeded in adopting the positive, on their behalf, attributes of commercial business practices

while retaining the escape hatches/options afforded by the old way of doing business. Industry is being asked to make investments as if it were a commercial contract while not receiving the type of assurances that normally accompany commercial type investments. Similarly, given that they end up with part of the business, the possibility of receiving commercial returns is nonexistent.

Even on the contract administration side the government is continuing to operate in a sole-source mode. "We still have to give cost and pricing data as though it was a sole source procurement."[21/] As such, the internal economics that could flow from doing business more like the commercial sector haven't materialized. The government is continuing to impose restrictions on every facet of the business while making it less attractive for industry to participate. The "costs" of doing business with the government are becoming inordinately high, both in terms of implicit financial risks and explicit economic costs of conforming to the tighter legislation on government business. "It now costs more for industry to do business with the government, particularly from the undue restrictions imposed."[22/] This current over-restrictive period may only be a temporary phase while the government continues to move towards a commercial mode. However, the consequences of maintaining this pseudo-commercial practice for long may severely limit the government's options downstream. Some companies have already begun to retreat from government business. Both Otis and Carrier, divisions of UTC, have announced that they no longer intend

to pursue contracts with the government; citing that the business is no longer attractive. With reduced defense budgets, more legislation, and fewer, yet more expensive systems being developed, it's only a question of time before others announce similar intentions.

For those who remain in the business a consolidation is not unlikely. The massive production capacity coupled with a reducing demand necessitates consolidation if companies are going to continue to thrive on defense business.

> As stakes get higher there will be a tendency for shrinking the defense industrial base."[23]

> There just isn't enough business to support a large number of competitors."[24]

> There are too many aerospace companies in some areas... there is too much competition."[25]

While the defense business for U.S. contractors is shrinking, international competition is becoming a player in the market traditionally enjoyed by the U.S. Their European allies are making headway in "weaning themselves from U.S. weaponry... The U.S. military meanwhile, is getting ready to make its first major purchases of West Europe defense equipment."[26] Some defense contractors see it as just a matter of time before the European market for U.S. combat systems dries up.

The European NATO countries are currently a larger net exporter of defense system than the U.S. This trend towards a globalized defense

market has been a stimulus for the forming of new joint ventures between European and U.S. defense companies. This renewed emphasis on bringing the Europeans up to a point of global competitiveness has been praised by many senior defense officials including Secretary of Defense Casper Weinberger.

> The Independent European Program Group... has done more than any other organization in moving down the road toward what we must have, a West Europe defense industrial base which can compete with the U.S."[27/]

With the future outlook of a reduce share of the global and domestic markets, these joint ventures, at least domestically, may only represent the courting before a marriage. "These arrangements represent a transient period prior to the reduction in the number of prime contractors."[28/]

Whether the courting ends in marriage is secondary to the issue of how the interim period of coexistence is spent. Will it serve to strengthen or weaken the U.S. defense industrial base? The cooperation between competitive firms, brought about through the "encouragement" by DOD, is unlike that seen before. These quasi-joint venture arrangements are as interesting as they are unstable; entered into for reasons of survival rather than market expansion. Joint ventures, as described by Roberts[29/] and others is an arrangement between two entities in which both contribute something to the whole. Usually companies enter into some sort of venture, be it a strategic alliance, joint venture, etc, to supplement their resources in order to be competitive in a new or existing market. These normally include

arrangements where a smaller firm with the entrepreneurial spirit joints with a larger company that has the management, financial, or sales and distribution channels. However, joint venturing, better referred to as teaming in DOD vernacular takes on a different meaning when applied to the domestic defense industry. A means to an end where the end represents developing a cost controlled weapon system.

The proliferation of these arrangements by the defense department, eitner through strong encouragement or requirement, is a direct consequence of the move towards fewer but higher priced systems in an environment where a large defense contractor base exists. The incentive for industry to enter into a pseudo-alliance with competitors comes in the form of the higher capital investment required by industry in order to secure a defense development contract. In order to minimize the risk of taking a large financial bath, companies are finding the less desirous alternative of joining forces with their competitors the only affordable means of participating in the defense business.

Some view the current move by DOD of cost sharing and FFP contracts in the R&D phase as the only way to do business in today's environment of reduced defense budgets and higher development costs. Yet the long term ramifications are the concern and argument of others who oppose DOD's new way of doing business. The two principal arguments cited include 1) higher financial risks with less assurance of return, and 2) technology leveling across the defense industry.

With the introduction of new technology critical to our success as a world leader in defense, the suppression of new technologies, because of the inability of companies to take on the financial risks, historically born by the government, may detract from the U.S.'s ability to remain dominant in national defense. "The requirement for more up front investment by industry will cause a stagnation of technology because of less investment they will make in R&D."30/ Also, it "may serve to suppress pursuit of those things which are in the best interest of the services."31/ Where historically a potential commercial spin-off was sufficient to justify taking the risk, today's systems and the technology they entrain have less applicability to commercial business, thereby making it increasingly difficult to justify the major investments required. As to the technology transfer that will undoubtably accompany these preordained marriages, Missimer believes "the effect of these approaches i.e., passing technologies between competitors vis-a-vis teaming and second sourcing, on the U.S.'s technological leadership will be negative."32/

Ward further cautions that we must be extremely careful so as not to find ourselves taking the incentive away from that which real competition brings out. "Once you take real competition out of the equation then you can forget about being number one. Once you make it easy for people to be mediocre and still get rewarded, you have defeated the purpose."33/

The financial liabilities incurred with defense contracts, particularly warranties, along with the requirements for breakout and second sourcing subcontracted components, will likely lead to further vertical integration either through acquisition of vendors or a decision to make verses buying. McAbee believes that "we can't continue, via warranty, to take a major liability where we don't have control over the parts being supplied to the government."[34/] As to passing the liability down to the subs, "they can't afford to take on the liability; a mistake would put them out of business."[35/] Therefore, with industry's reluctance to stand behind hardware which isn't under their direct control and the subcontractors inability to accept the financial risks, a move towards integration is inevitable unless the government backs off of their stance on sourcing, breakouts, or warranties.

Probably the largest single change which is having a pronounced negative effect on government-industry business practices and relationships is Congress' involvement in the operations side of the defense procurement business. Their micro-managing of DOD's business has almost crippled the acquisition process. This renewed interest by Congress has come on the heals of criticism of DOD's handling of the past procurements, specifically related to contractor indictments for fraud, spare parts pricing horror stories, etc. Almost everywhere industry and DOD turns, Congress is there to oversee and impose new legislation further curtailing their effectiveness in managing the defense acquisition business. Table 4.1 contains a tabulated summary

Table 4.1 Congressional Actions as Part of Oversight and Review

	1970	1976	1982	1985	% Increase 1970-85
Requested studies & reports	36	114	221	458	1172%
Other mandated actions	18	208	210	202	2022%
General provisions in law	65	96	158	213	223%
Number of programs adjusted:					
In authorization	180	222	339	1315	631%
In appropriation	650	1032	1119	1848	184%

of the Congressional actions pertaining to their micro-managing of DOD. Wood attributes Congress' muddling in DOD's affairs as an outgrowth of past performances but more importantly the application of the rapidly advancing field of information technology to the defense business.

> The rapid flow of information today within DOD and Congress has served to radically change the way we do business, principally as it pertains to Congress' micro-managing of programs and processes."[36]

Where, 10 years ago, timely flow of information across and through all levels of government was minimal, today almost anyone can obtain an update or status of the issues/events on nearly any program. Thus, the day-to-day operational decisions which used to be under the sole purview of the program manager and his staff are now "fair game" for those in Congress and DOD that are interested in meddling. "They're (Congress) micro-managing of our programs is making it almost impossible for us to do our job."[37]

Excepting Cooper, who believes that it's necessary to have Congress involved since they represent the public company's board of directors, few see any value added by the role that Congress has assumed. Cooper does agree that we need to stop and reflect while letting the changes that have come about in the procurement regulations/laws take effect. "We should place a hold on new laws or initiatives for the next few years... It's almost impossible to measure the cause and effect of what we're doing."[38] Many see the issue as a case where the left hand is unaware of what the right hand

is doing, both of which are attached to the same Congressional body. Industry officials feel that much of the new legislation represents a shotgun approach to decriminalizing the procurement process. Rather than limiting their involvement to policy matters they have taken on the responsibility of policing the procurement process through new rules and regulations. There are Congressmen operating outside of their areas of jurisdiction with no means of controlling them. With the impact of recent legislation 3-5 years off, it will be some time before the process reacts and moves to undo the tangled web being spun today. In the interim, the micro-oversight will likely continue and the added burden to both industry and government officials will take its toll, both in having less capable systems developed by those who chose to remain and in the movement of frustrated talent to other business sectors.

Additionally, we're likely to see more programs going "black", an alternative that in the past has been effective in keeping the issues confined to those responsible for managing the program. Otherwise, the damage may be severe and widespread. "There is no regard for the total effect of all the new legislation, it may end up killing the industry as it exists today."[39/] "The trends are bad; we're headed for disaster... there needs to be a move by DOD to take back the management of the business."[40/]

To spur on some of these changes DOD, in response to the Packard Commission's recommendations and the Goldwater-Nichols Reorganization

Act of 1986, DOD established a new position, Under Secretary for Acquisition, responsible for streamlining the defense acquisition business across the services while cleaning up the legislative mess left by Congress. "We have had a plethora of legislation over the past two years, contradicting legislation in that one tells you to do one thing and another says don't do it."[41/] To the President's appointed acquisition czar, Richard Godwin, effectiveness will likely be proportional to the degree of autonomy he is given in revamping the procurement system. Whether Congress affords Godwin the luxury of calling his own shots without their continuous involvement will have a pronounced affect on his ability to do that which is being asked of him - get the acquisition train back on track and moving forward. As to what industry should be doing while Godwin and his staff go about straightening up the maze of contradictory regulations, Cooper advocates "playing more towards the middle of the field... the foul lines (regulations) are continuing to be moved inward, in some cases retroactively."[42/]

One thing is for certain, it will be some time before industry is apt to see any major "improvements" in the acquisition process. DOD at least has taken the first step in unifying their defense to Congress. Whether this unification will result in a more consistent acquisition approach being applied by the services in unknown.

With current approaches ranging from two manufacturers for the same system (F404) to two different systems (AFE) fulfilling the same

mission, while including cost shared fixed price joint development contracts that may be followed by separate production contracts (LHX, ATF, V-22) any consolidation would be welcomed by industry. Godwin's challenge appears almost insurmountable when contrasting the changes which have come about over the past 10 years, and what it took to bring them about, to the task before him. Industry and government officials, while endorsing the formation of this new position, express skepticism of the effectiveness and influence that the Under Secretary will have in making the necessary changes. Without question the next two years in the defense acquisition business is likely to be anything but dull.

Where is this leading us? Although there is probably as many opinions as there are people in the business, a common view is shared by many from industry. McAbee, along with O'Connor and Ward believe the U.S. is headed towards nationalization of the defense industry. Nationalization, as a possible alternative to the problems ailing the defense industry is not one which is favored by many. "Nationalization is neither the second best solution nor the will of the Congress and people."43/

Yet it may be the only choice to rescue the defense industry from severe financial problems if they were to find themselves confronted with that situation. Others argue that the picture will change before irreparable harm is done. The old adage that "if you don't like what you see now, just wait awhile, its sure to change," amply characterizes

the environment in the defense business. "We're betting on the come that things will change"[44/] --hopefully to the benefit of all concerned. As for now it's fair to say that future change, for better or worst, is inevitable.

This metamorphic period in defense acquisition is a clear signal that government bureaucrats are no longer sitting around rubbing their hands worrying about the problems which have long been recognized. It now appears that we are entering the most intense stage of change undertaken heretofore. Whether that which emerges takes the form of a beautiful butterfly or an ugly moth is subcutaneous to all but that which exists within.

Therefore, when reflecting over the past five years it's easy to recall numerous instances where the government was in the news with articles condemning or criticizing DOD's acquisition practices and policies. At first glance it seems reminiscent of the criticism that has surrounded the business for the past twenty years. Yet what clearly distinguishes this era in defense acquisition from those which preceded it is that much of the criticism and ensuing turmoil were the by-products of the substantive changes that were beginning to emerge in the defense acquisition business. The publicity which accompanied the changes helped to further feed the process. Although representing insignificant exceptions, the highly publicized claims and press coverage of $600 hammers and "gold-plated" toilet seats, had a pronounced affect on gaining boisterous support for reform. The

movement has continued to gain momentum ever since, bringing with it a proliferation of legislative changes. Some are now beginning to recognize that the mob mentality that is characteristic of the current movement may end up inflicting more damage than good if left to its own devices. As such, efforts are now underway by DOD to retard further movement while cleaning up the legislative mess left in trail.

To assert that this current reform was spawned by the public praise and visibility that surrounded the AFE competition is to attach too much importance to this single event. However, it's reasonable to assume that the AFE competition provided an extremely strong stimulus for changing a process that had long been criticized. With the environment ripe for change the resounding success of an initiative that paralleled the treatment prescribed by defense acquisition critics for two decades, started the change process that has come to be described as "feeding upon itself".

As a whole, the form of the changes taking place are likely to be positive while the specific changes will require a few iterations before converging to an equitable solution where industry and government can function effectively. This will only happen when both parties can consummate a lasting relationship and work together as a team rather than adversaries. Providing industry with more autonomy through reduced restrictions and intervention (micro-managing) by government agencies while promoting open competition is an industry

sought after means to this end. An adaptation of this recipe proved to be a winning formula for G.E. in the AFE competition.

It is only a question of time, if we are to avoid degenerating into a nationalization of the defense industry, before the government recognizes the shortcomings of their current acquisition practices. The acquisition pendulum appears to be swinging too far to the side of rigidity. A return towards the center through increased flexibility in managing the process is a prerequisite to sustaining a healthy defense industrial base. The belief by many that it will take a major crisis or disaster before the government takes action to reverse the current trends toward nationalization appears unfounded. The government will likely step in even if that entails stepping out, to insure that a strong competitive defense base exists in this country. Whether a natural reduction in the number of participating firms will accompany the shaking out of the recent changes in defense procurements is another issue entirely. Current trends would suggest that further consolidation of the industrial base is likely.

The question of who will go and who will stay is somewhat academic, since "to go" may simply be a surrogate for "acquired". Some believe that a consolidation would be beneficial to the public and the government. "Fewer, but stronger, competitors would be beneficial for the Pentagon and the taxpayers."[45/] For those who remain it is unclear as to how the defense business will look. The trend towards tighter regulations, lower budgets, higher risks

(cost-sharing, FFP contracts, warranties, split awards), and international competition doesn't paint an attractive picture for those looking to do future business with the government. However, like an over-constrained problem the inability to find a solution will force a relaxation of the constraints. Elimination of FFP contracts for demonstration and pre-development contracts, DOD's relaxation of the profit ceiling or willingness to fund the R&D effort, rescission of conflicting and over restrictive legislation, multi-year funding commitments, and reduced oversight by Congress and DOD represent a collection of possible alternatives whose net effect to industry and the government would likely be positive. As to what event(s) will trigger the government into taking action to stop the continuing barrage of restrictive changes on defense acquisition is unknown. All that can be said for certain is that it will change; just as people come and go in the government, so will new policies and practices. The process by which these changes will come about can best be described as metamorphic in nature.

APPENDIX 1

Summary of Recent Legislation and Initiatives Pertaining to Defense Acquisition Policies and Practices

MAJOR LEGISLATION AND INITIATIVES AFFECTING DEFENSE PROCUREMENT

LEGISLATION

1. National Defense Authorization Act of 1987 (Defense Acquisition Improvement Act)	P.L. 99-661	14 Nov. 1986
2. Federal Technology Transfer Act	P.L. 99-502	20 Oct. 1986
3. Goldwater - Nichols DOD Reorganization Act of 1986	P.L. 99-433	1 Oct. 1986
4. DOD Authorization Act of 1986	P.L. 99-145	8 Nov. 1985
5. DOD Authorization Act of 1985	P.L. 98-525	19 Oct. 1984
6. Deficit Reduction Act	P.L. 98-369	18 July 1984

INITIATIVES/COMMISSIONS

1. Packard Commission on Defense Acquisition	28 Feb. 1986
2. Grace Commission on Cost Control	Jan 1984
3. Carlucci Initiatives for Improving the Acquisition Process	30 April 1981

Summary of Defense Acquisition Change Enacted Over the Last Five Years

TITLE	STATUTES	SYNOPSIS OF MAJOR CHANGES
Natl Defense Authorization Act of 1987	P.L. 99-661 14 Nov. 1986 Section 901	Defined rules & responsibilities of Defense Acquisition Executive (DAE).
Subtitle--- Defense Acquisition Improvement Act	P.L. 99-661 14 Nov. 1986 Section 909	Amended Chpt 139, Title 10, U.S.C. to include Section 2365 Competition protype strategy requirement for major defense acquisitions". (a) Secretary of Defense required to use competitive prototype procurement strategy. (b) Qualifying strategies require that contracts be entered into with not less than two contractors.
	Section 911	Establish goals for increased use of multi-year contracting.
	Section 912	Federally funded R&D centers. (a) Limits use of federally funded R&D centers for DOD work. (b) Limits creation of new centers by DOD.
	Section 943	Revision of Work Measurement. Amends Section 2406, Title 10, U.S.C. (a) Requires cost & pricing data as though contract is sole source, excepting when price is based upon adequate price competition. Proceeds to state that data may still be required to evaluate "reasonableness" of contract price
	Section 953	Amends Section 2320, Title 10, U.S.C., "Rights of Technical Data" (a) Gives government freedom to disclose data to other persons when exclusively funded by government. (b) Gives contractor limited rights to restrict disclosure if 100% privately funded. (c) Partial disclosure when jointly funded.

Summary of Defense Acquisition Change Enacted Over the Last Five Years (continued)

TITLE	STATUTES	SYNOPSIS OF MAJOR CHANGES
Goldwater - Nichols DOD Reorganization Act of 1986	P.L. 99-433 1 Oct. 1986	Reorganized DOD adding Under Secretary of Defense for Acquisition while deleting Under Secretary for Policy and Director of Research & Engineering.
(Update to 1958 reorganization of National Security Act of 1947 which established National Military Establishment...later renamed DOD in 1949)		Designed to improve quality & enhance role of professional military advisors, strengthen civilian control & reduce burden of Congressional oversight.
DOD Authorization Act for 1986	P.L. 99-145 8 Nov 1985 Section 142	Requires competitive acquisition for FY86 aircraft.
	Section 911	Amends Section 2324, Title 10, U.S.C., "Allowable Costs under defense contracts. Thrust of changes aimed at limiting claims for expenses incurred in conduct of business.
	Section 912	Amends Chpt 137, Title 10, U.S.C., "Multiple Sources for Major Defense Acquisition Programs." Introduces a requirement to employ acquisition strategies that provide for alternative competitive sources from beginning of development through to completion of production. Stipulates that agency should award enough business to losing competitor so that they can compete effectively in future years.
	Section 913	Specifies that DOD Secretary must set & report a percentage goal for competitive procurements. Minimum specified to be 50%
DOD Authorization Act for 1985	P.L. 98-525 19 Oct. 1984 Section 102	States that warranty cost for gas turbine engines must be limited to <10% of contract value.

Summary of Defense Acquisition Change Enacted Over the Last Five Years (continued)

TITLE	STATUTES	SYNOPSIS OF MAJOR CHANGES
Subtitle--- Defense Procurement Reform Act of 1984	Section 1201	Amends Chpt 137, Title 10, U.S.C., to include: (a) direct use of commercially available hardware (b) use of competitive procurement. (c) use of multi-year procurement.
	Section 1234	Adds Section 2403 to Chpt 141, Title 10, U.S.C., to include Weapon System contractor guarantees. (a) Agency cannot enter into a contract w/o written guarantee from contractor that covers conformance to design & manufacturing requirements, be free of defects, and meets performance requirements. Adds Section 2402 to Chpt 141, Title 10, U.S.C., restricting contractor from limiting direct sales of subcontractor parts to the government.
Deficit Reduction Act of 1984	P.L. 98-369 18 July 1984	
Subtitle---- Competition in Contracting Act		Imposes requirements for competitve procurements by amending Federal Property & Adm. Service Act of 1947 (41 USC 253)

Summary of Defense Acquisition Change Enacted Over the Last Five Years (continued)

TITLE	STATUTES	SYNOPSIS OF MAJOR CHANGES
INITIATIVES		
Packard Commission Report on Defense Acquisitions	28 Feb. 1986	Recommends reorganizing DOD & creation, by statute, a position of Under Secretary of Defense for Acquisition. Also recommends (a) use of technology to reduce costs (b) Recodification of federal laws governing procurement into single statute (c) expanding use of multi-year procurements (d) expanded use of commercial products (e) increase use of competitve procurements (f) improving quality of procurement personnel
Grace Commission's Proposals for Cost Control	Jan 1984	Recommends increase use of : (a) multi-year funding (b) common parts (c) dual sourcing
Carlucci Initatives for Improving the Acquisition Process	30 April 1981	Recommended : (a) multi-year funding (b) fully funding the R&D phase of a defense program (c) improving the budgeting process so to avoid "buying-in" (d) providing upfront money to contractors (e) prototype testing (f) increased use of competitive procurements (g) decentralization of procurement decisions (h) reduced oversight by Congress & OMB (i) not using FFP contracts for the R&D phase of a program (j) establishment of a Defense Acquisition Executive

SUMMARY OF SIGNIFICANT DEFENSE PROCUREMENT CHANGES & SOURCES

Legislation or Initiatives	DOD Orgn.	Competitive Procurement	Technical Data Rights	Profit Limits	Dual Sourcing	Breakout	Guarantees Warranties	Allowable Costs	Multi-yr Contracts	Cost & Price Data
P.L. 99-661 14 Nov. 1986	x	x	x	x	x				x	x
P.L 99-433 1 Oct. 1986	x									
P.L. 99-145 8 Nov. 1985		x			x			x		
P.L. 98-525 19 Oct. 1984						x	x		x	
P.L. 98-369 18 July 1984		x								
Packard Commission 28 Feb. 1986	x	x							x	
Grace Commission Jan 1984					x				x	
Carlucci Initiatives 30 April 1981	x	x							x	

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