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AFIT/GLM/LSY/88S-45

ANALYSIS OF
THE AIR FORCE AND THE GREAT ENGINE WAR

Thesis

Victoria M. Mayes

AFIT/GLM/LSY/88S-45

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AFIT/GLM/LSY/88S-45

ANALYSIS OF
THE AIR FORCE AND THE GREAT ENGINE WAR

Thesis

Presented to the Faculty of the School of Systems and Logistics
of the Air Force Institute of Technology
Air University
In Partial Fulfillment of the
Requirements for the Degree of
Master of Science in Logistics Management

Victoria M. Mayes

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Table of Contents

	Page
Acknowledgements	ii
Abstract	v
I. Introduction	1
Overview	1
Background	1
Purpose of this Study	3
Justification	4
Research Objectives	5
Scope and Limitations	6
II. Methodology	7
Introduction	7
Phase I	8
Phase II	8
Phase III	9
Phase IV	9
Phase V	9
Investigative Plan	10
The Interview	11
Analysis of Data	11
III. Case History	12
Introduction	12
Background	12
Initial Outcome	14
Follow-On Buys	15
Current Situation	15
Future Plans	16
IV. Research Findings	17
Introduction	17
Pratt and Whitney Aircraft	18
General Electric	24
Engine SPO	29
V. Summary, Conclusions, and Recommendations	38
Introduction	38
Summary	38
Conclusions	39
Recommendations	41

	Page
Appendix A: Interview Guide	44
Appendix B: Interview List	46
Bibliography	47
Vita	49

Abstract

The purpose of this study was to provide a case analysis of the Alternate Fighter Engine (AFE) program to determine if competition can be successfully applied to a DOD weapon system acquisition program. The basic question to be answered was; how has the competition between Pratt and Whitney Aircraft and General Electric for the AFE developed and has it been successful? The research was expected to provide answers to the following questions: 1) What were the desired benefits (goals)? 2) Has the competition been successful, to what extent have the goals been satisfied? 3) Have there been any undesirable 'side-effects'? 4) Does the approach used for the AFE appear promising for other programs?

The research was conducted through personal interviews with knowledgeable individuals from Pratt and Whitney Aircraft, General Electric and the Engine System Program Office. (SPO). The interviews provided primary data for analysis, which, when combined with available secondary data, presented a complete picture of the case.

The competition as conducted on the AFE was one of the Air Force's first attempts to comply with the Competition in Contracting Act of 1984, by continuing competition into the production phase of a program. One of the reasons that this program was selected was that Pratt and Whitney had been the sole producer of the Air Force's fighter aircraft engines during the 1970's and 80's, and they had become non-responsive to the needs of the Air Force. Also, there was a move to enlarge the industrial base, improve reliability of engines, and reduce overall Life

Cycle Costs (LCC). This combined with the problems with dealing with Pratt and Whitney Aircraft gave rise to 'The Great Engine War' as it has come to be known (6).

The interviews resulted in the identification of benefits and issues that have developed from the competition. The primary benefits were: better responsiveness from the contractor, more reliable engines, better and cheaper warranties, lower engine cost, and a broader industrial base. The following issues were also identified: less utilization of available production capacity, cutbacks resulting in less surge capability, and difficulty providing proposals with numerous 'scenario and quantity requirements'.

Finally, recommendations were made for improving the process as follows: Consider AFE buys along with the Improved Performance Engine (IPE) buys to minimize the impact with the Foreign Military Sales (FMS) customers. Reduce the requirements for pricing data whenever competitive pricing has been obtained. Let the competition determine when a single award is more beneficial than continuing the competition.

The competition as conducted on the AFE program provided positive results. The circumstances on this program that led to the success, however, may not be repeated on future applications. The general consensus was that competition into a production program is worthwhile as long as the quantities being produced justify the process.

ANALYSIS OF THE AIR FORCE AND THE GREAT ENGINE WAR

I. Introduction

Overview

This chapter discusses the current trend in DOD major weapon system acquisition towards competitive production and the impact it has upon the government/contractor relationship. Background information is provided as a basis for understanding the competition policy implemented on the Alternate Fighter Engine (AFE) program. Chapter I continues with the purpose of the study, the importance of and justification for this research, and identifies the research objectives and specific research questions. The chapter concludes with the scope and limitations of the research.

Background

The 1980's brought about many changes in the government contracting process. One particular change has been an increase in the emphasis in maintaining competition on major weapon system acquisitions throughout program life cycles, including the production phase. This policy change was confirmed by the Competition in Contracting Act (CICA) passed by Congress in 1984 (16:ES-1).

Since that time, strong pressure has been placed on individual programs to comply with the new, stringent requirements for competition. One of the early and well known attempts to satisfy this requirement has been the competition between Pratt and Whitney Aircraft and General

Electric on the AFE program. The program manager for the AFE was given specific guidance on how to conduct the Request for Proposal (RFP) and Source Selection Process with specific goals for increasing competition. Former Secretary of the Air Force Verne Orr referred to this as 'the Great Engine War' and said it was '...perhaps the most significant Air Force acquisition initiative in the past decade' (6:1).

'The Great Engine War', as it is known, has pitted the F100 engine produced by Pratt and Whitney Aircraft against the F101 fighter derivative engine (now called the F110) produced by General Electric. The competition between the two companies has been fierce and is likely to continue for several years to come. The initial solicitation was centered around the objective of enhancing performance and reliability, while controlling the cost of the system through the use of competition (6:1).

Congress was not convinced that this splitting up of the AFE production was true competition; however, Lt General Kelly H. Burke, USAF Deputy Chief of Staff for Research, Development, and Acquisition, was able to successfully argue that what was taking place was a competitive effort between both companies that would last for ten years. This effort, he said, could result in better reliability and enlarge the industrial base at the same time (19:13).

The final results of this effort will not be known for some time, as this competition is expected to continue for several more years. The effort may be even further extended, if the follow-on competition for the next advanced generation of engines (or improved performance engine) is considered. The entire defense acquisition community has been

waiting anxiously for the results of this initial competitive effort, or at least a sign as to the progress that has been made.

An initial review of this effort was provided by Colonel Robert W. Drewes in his book, The Air Force and the Great Engine War, which was used as the basis for this research. His research was conducted primarily in the 1983/84 timeframe, although the book was not published until 1987. He indicated that the overall competition appeared to have been a great success, but said that further research was needed to fully explore the impact of competition on the AFE program. This research is a follow-on effort as suggested by Col Drewes (6:138).

Purpose of this Study

General economic theory would lead one to believe that competition in the market place is considered to be beneficial and should be pursued in the business environment. In the writer's experience, this principle seems to be generally accepted by most people. The CICA, passed by Congress in 1984, made competition a firm requirement for DOD major weapon system acquisition programs. However, many people feel that the DOD business environment does not necessarily support the general conditions required for full and open competition as found in the private sector.

In generating competition among contractors, certain costs and risks are incurred and must be absorbed by the program. The question is whether competition on a given DOD program is worthwhile. Do the benefits/savings exceed the costs? This study is proposed to provide a case analysis on one such program where competition initiatives have been applied to evaluate the success of the application to a DOD

program. The specific question to be answered is, has the competition between Pratt and Whitney Aircraft and General Electric been successful?

Justification

The DOD cannot afford to wait for the completion of the AFE program to determine if competition in major acquisition production programs is beneficial. There has been much concern over the potential negative effects of competition in situations where it might not be appropriate. In one article discussing the use of competition for major weapon system acquisition programs, Air Force Brig Gen William P. Hallin said, 'Certainly we don't want to look back five years from now and say, 'Oh my God! We did this in the name of competition?' (14:13).

Other concerns were voiced by an Air Force Institute of Technology (AFIT) school committee in response to Issue Papers from the United States Senate Subcommittee on Defense Industry and Technology. Their response to 'Incentives for Innovation (B-32)' recommended flexibility in applying the current law on dual sourcing saying that 'DOD should have the discretion to pursue sole-source development if, in their judgment, the costs of competition will exceed the projected savings' (21:10).

In response to another issue paper on 'Price Only Competition (B-34),' the 'Defense Industry Advisory Group' said that by changing the wording of the CICA it would 'Demonstrate that the intent of CICA is not competition for competition's sake, but rather competition when it makes sense...' (21:11).

Although competition is normally accepted as a good business practice, there has been concern among those knowledgeable in

contracting in the DOD environment as to the applicability of competition under major weapon system acquisition situations. Dr. Jacques S. Gansler, a well-known author of articles on competition in the military environment, says that competition in weapon system acquisition can produce positive results provided proper caution is taken and each program is evaluated on a case-by-case basis. He says when applied properly, competition can provide a multitude of benefits to the government, such as reduced costs and improved weapon system readiness (16:ES-5). A study is needed to provide insight into the current status of the DOD implementation of the CICA and to provide an interim answer as to the success of 'The Great Engine War' (6).

Research Objectives

This research is planned to analyze the results thus far of the AFE competition and to provide recommendations for future applications. This will be accomplished by examining the following research questions:

- a) What were the desired benefits (goals) of the AFE competition?
- b) Has the competition between Pratt and Whitney Aircraft and General Electric been successful? To what extent have the goals been satisfied?
- c) Have there been undesirable 'side-effects' from the competition? What were the costs/risks attributable to the competitive effort?
- d) Does the approach used for the AFE appear promising for other programs? What reasons are there (if any) not to try it again?

Scope and Limitations

This research will concentrate on the competition surrounding the AFE program from 1983-1988. As the program is still ongoing, this is to be an interim report as to the status of the program and the state of the competition. An attempt will be made to obtain significant facts from this effort from which to draw strong, objective conclusions. In order to minimize the introduction of bias into the results, face-to-face interviews will be used. As external validity cannot be expected from a case analysis such as this one, the ability to generalize the results will be limited.

II. Methodology

Introduction

This research is being conducted to investigate the competitive effort that has been conducted on the AFE program. The method to be used in conducting this research will be a case analysis. The research will be a cross-sectional study, conducted through interviewing government and contractor personnel. A cross-sectional study (i.e. a 'snapshot' at a certain time) is necessary as a longer term, ongoing effort is not possible given the time constraints on this research. The intent is to examine the historical facts as they actually occurred; no attempt will be made to 're-interpret' or change those historical facts (7:60).

A case study in itself signifies that a vast amount of data is not readily available in a form suitable for analysis. Most of the data needed to conduct this research has either not been collected at all, or has been collected in such a way that requires a large effort to organize into a researchable form. The primary goal of the case study is to logically collect and organize the data such that a reasonable analysis can be accomplished (p 72).

As recommended by Lt Col Ronald Calkins in his article on research methods, this research is being conducted as a follow-up on Colonel Drewes' study (3:6). Lt Col Calkins indicated that by using what he called programmatic or piggyback research, then academic research can become 'both educationally and organizationally valuable' (3:47;4). He said that only after several iterations of studies can the results be 'synthesized into more structured predictions' (3:49).

Data will be collected through a literature search to obtain both primary and secondary data and through personal interviews to obtain first-hand knowledge from selected experts. The plan is to obtain and evaluate the data in order to establish the facts surrounding the competition and draw conclusions (4). Data collection occurs in five phases.

Phase I

The first step in the research process was to validate the need for the information. This was done to ensure that someone in the DOD community was interested in knowing the status of the AFE competitive effort. Discussions with Mr. Ronald Mutzelburg, the Director of the Tactical Engine System Program Office (SPO), led the writer to believe there was sufficient interest within the Air Force to continue with the research (18).

Further, in Colonel Drewes' book, The Air Force and the Great Engine War, Col Drewes indicated the need for a follow-up study (6:138). Final verification was received from the researcher's thesis advisor, Major Charles M. Farr, who is an AFIT instructor in the contracting and acquisition area. Major Farr indicated that he thought someone needed to address the competition issue, and that the AFE program could provide the necessary data.

Phase II

This phase was initiated to conduct an in-depth literature search through the AFIT library, a Defense Technical Information Center (DTIC)

search, and a books-in-print request. This resulted in source documents to be used in the case analysis.

Phase III

The next step involved an extensive review of the AFE SPO documentation. This included policy and official direction, and other program documents available in the SPO's historical files. As the competition is still ongoing, any limitations on public release of information will be honored.

Phase IV

Based on the knowledge obtained through the first three phases, informal, exploratory interviews were held with key program office personnel, some who have been with the program office since inception of the competition. This resulted in primary data from knowledgeable personnel, and assisted in defining the key issues associated with the competition.

Phase V

The final step in the data gathering process was to conduct structured interviews with the involved contractors (Pratt and Whitney Aircraft of West Palm Beach, Florida, and General Electric of Cincinnati, Ohio). During Phase IV, SPO personnel were asked to identify key contractor personnel for further investigation. Letters were sent to the contractors asking for their participation. Both contractors responded favorably to the request for assistance by identifying their key players in the effort. These individuals were

then personally interviewed, which provided several advantages. In contrast with the more impersonal use of a written questionnaire, face-to-face interviews made it possible for the author to clarify the meaning of certain questions for the research participants. Personal interviews also allowed the respondents to further explain their answers through the use of examples and other additional information.

Investigative Plan

Through interviewing selected individuals on the Air Force staff (SPO) and both contractors (Pratt and Whitney Aircraft and General Electric) the researcher believes that error resulting from individual bias was reduced. This was thought to be true due to obtaining multiple opinions rather than relying on an individual source. Also, the contractor personnel were expected to provide their respective company positions as well as their own. The judgmental aspect was minimized by selecting key, knowledgeable personnel who have been with the program long enough to provide the history/background necessary to conduct this research (4).

Personal interviews were used to get the most benefit from the limited number of people that could be identified. This resulted in first-hand, primary data from the resources available. Interviews were chosen over a questionnaire because more flexibility is possible using the interview method and specific questions can be generated through the discussions. Also, face-to-face interviews provide more reliable results as the respondents can ask questions of the interviewer and the

belief that personal interviews encourage respondents to be more open and honest with the interviewer (4;24).

The Interview

An interview guide, shown in Appendix A, was used by the interviewer to maintain consistency in the information collected during the interview process. Although with face-to-face interviews some flexibility is necessary, the guide was used to aid the interviewer to ensure adequate coverage of the research questions with each interviewee, but still allow for the discussion to expand into other areas when appropriate. The main requirement was for the interviews to result in new data that, when analyzed, would result in a complete picture of the events surrounding this particular case (9:56).

Analysis of Data

This type of case analysis requires the researcher to do a subjective interpretation of qualitative data and to synthesize the results into a valid conclusion of the case. Based on the established facts and the best judgment of the researcher, conclusions were drawn as to what has occurred on this particular case and recommendations made for future application (4).

III. Case History

Introduction

Pratt and Whitney Aircraft had been the sole provider of fighter engines for the Air Force during the 1970's and early 1980's. The relationship between the government and the contractor personnel had somewhat deteriorated toward the end of this period for various reasons, as discussed in Col Drewes' book (6). The contractor was taking advantage of their monopoly situation and was not being very responsive to the needs of the Air Force. When problems developed, Air Force program office personnel found that they had no leverage to negotiate contract changes with Pratt and Whitney Aircraft. Supportability and reliability issues were not getting resolved, which when combined with the simultaneous emphasis in using competition in government contracting led to the resulting 'Great Engine War' (6). The Air Force was interested in getting better engines, and wanted them at a lower price (10:122). Readers interested in a more detailed history may refer to Col Drewes book (6). Another view of the historical background can be obtained from a thesis written by Jon Steven Ogg (20).

Background

The Grace Commission said that the experiences in the private sector dealing with competition and profit can be applied to the public sector as well. 'Both sectors must deliver a product or service at a price the public is willing to pay.' This, however, is not to say that there are not major differences between the procurements in the for-profit sector and the defense sector. The government tends to buy very specialized

and very expensive items for which there are no substitutes; such as the sample given of 'fighter aircraft engines' (13).

This requires a different type of arrangement between the buyer (the government) and the seller (the defense contractors). Both actually work together more as a team in the design and production of defense hardware and equipment. As the relationship of this team had deteriorated over time between the government and Pratt and Whitney Aircraft, the competition for the Alternate Fighter Engine (AFE) was born (6).

The problems with the F100 that led to this competition and 'The Great Engine War' have been broadcast and published several times. The intent of this thesis was not to dwell on the past or throw stones at anyone, but to evaluate what has actually occurred since the competition has taken place in order to determine if the effort was worthwhile and whether or not future application is deemed beneficial.

Some of the key issues that motivated the competitive production effort included: 'prices, spares and warranties' (13:16). Other areas of concern were 'operability, durability, and maintainability' along with Life Cycle Costs (LCC) (13:14). These were listed specifically as areas that were expected to be improved through the use of competition and were to be deciding factors in awarding the competitive contracts that resulted (13:14).

The Request for Proposals (RFPs) that were released to Pratt and Whitney Aircraft and General Electric included significant improvements in the wording to ensure major gains over past contracts in the areas specified above. For instance, the Air Force really wanted more commitment from the contractors in the warranty area, not only to get

better warranty coverage, but in hopes of getting better quality engines as well.

Not everyone, however, was in favor of the competitive effort being pursued. Pratt and Whitney was not in favor of the competition as they could only lose from its existence. A report prepared by 'The Surveys and Investigations (S&I) staff of the House Committee on Appropriations' and signed off by C.R. Anderson, chief of the S&I staff, stated that 'the competition would generate additional costs and acquisition redundancy' and provided support to Joseph Addabbo (D-N.Y.), who opposed the competition (13:18). Another opponent was Senator Christopher Dodd from Connecticut, where Pratt and Whitney's headquarters are located. Senator Dodd sent a letter directly to Air Force Secretary Verne Orr in an attempt to stop the Requests for Proposals from being released (13:15). Verne Orr was determined to continue the competition in order to show 'the American people that both the Congress and DOD are serious about driving down defense acquisition and support costs' (13:19).

Initial Outcome

The outcome of the initial competition, which was also well publicized, was that General Electric received 75 percent of the next fiscal year (FY85) buy of fighter aircraft engines and Pratt and Whitney Aircraft received the remaining 25 percent (5). What was not often mentioned, was the fact that Pratt and Whitney Aircraft was already on contract to build a quantity of F100 engines during that same time and when it was realized (after the initial 75/25 split), that the planned deliveries would mean a mixing of configurations of engines within a wing at Eglin Air Force Base, 49 F100 engine buys that were already on

order with Pratt and Whitney were also converted to the -220 (Pratt and Whitney) configuration. Therefore, Pratt and Whitney was not initially hurt as badly as it may have seemed (2;18).

Follow-On Buys

After the initial competitive buy, work was started for the succeeding years. Each contractor was given the opportunity to update their initial proposal, providing the changes were beneficial to the government. The updated proposals were then used to make the decision for award of the next fiscal year's contracts. Over time, the percentages between Pratt and Whitney Aircraft and General Electric changed back and forth. The follow-on AFE buys looked like this:

<u>Fiscal Year</u>	<u>General Electric (Percent)</u>	<u>Pratt and Whitney (Percent)</u>
FY86	54	46
FY87	56	44
FY88	45	55
FY89	45	55

NOTE: These were USAF AFE buys only (18).

Current Situation

The contractors are still competing each year for the next fiscal year's award of engines. However, the quantities are getting smaller with each buy. Recently, concern has been expressed over whether the current quantities justify keeping two engine lines in operation and if the competition can continue to result in savings using dual-source production. As one of the reasons behind this competition was to broaden the business base, there may be a need to keep both facilities gainfully employed, even beyond the point of minimal plant efficiency

due to excess production capacity. There is an obvious trade-off between economical production rates, plant capacity, and enlarging the industrial base in the area of fighter aircraft engines.

Future Plans

Government and industry managers are now anticipating the next generation of engines, referred to as the Improved Performance Engine (IPE). These engines are the next generation of fighter engines being developed by Pratt and Whitney Aircraft and General Electric to be considered in the follow-on competition to the current General Electric F110 and the Pratt and Whitney -220 engines. The FY90 buy will be a transition year, as both Alternate Fighter Engines (AFEs) and Improved Performance Engines (IPEs) will be procured during that time. We need to understand the impact of competition on the AFE as best we possibly can, so that management can make informed decisions for the IPE program. The issue concerns more than just the Air Force projected buys. The primary concern for the future is expected to be in the international arena, as the foreign customers have historically followed the pattern of buys set by the Air Force (1;2;12;11;17;18;22;23).

IV. Research Findings

Introduction

This chapter presents the opinions of the individuals interviewed from the engine System Program Office (SPO), Pratt and Whitney Aircraft and General Electric. Although opinions differ somewhat from person to person, the interviewer has attempted to portray the collective management position of each organization while still capturing individual perceptions. As individuals had varied backgrounds and levels of experience, the conclusions presented in the final chapter have been developed based on the findings as shown in this chapter and the best judgement of the author.

One unexpected comment that was voiced throughout the interviews was the comparison of the competition as conducted by the Air Force on this program to the Navy approach used on the F404 engine for the FA-18, a Navy fighter aircraft. The Navy program was actually a second sourcing of the F404 engine, as the Navy took the General Electric design and drawings and gave them to Pratt and Whitney to build the same engine. The unanimous opinion from the interviewees was that the Navy's approach did not foster true competition, and that the Air Force approach was more acceptable to all (1;2;11;12;17;18;22;23;25).

That opinion represents the view of many in private industry who are concerned about the potential loss of technology to their competitors. The Navy approach is referred to as 'leader-follower' in which the company that performs the development work on the weapon in question is required to transfer technology to a 'follower' company(ies) for production. The 'leader' faces the loss of all or some portion of

the ensuing production base. There are at least five accepted methods of generating competition during production, and the interested reader is referred to Defense Systems Management College's Developing Competitive Production Sources for a complete treatment of these various approaches (15).

Pratt and Whitney Aircraft

Pratt and Whitney Aircraft had been the sole producer for fighter engines for the Air Force during the 1970's and early 1980's. They had the most to lose by the competition in "The Great Engine War" (6). However, the representatives interviewed for this effort were very receptive and eagerly provided insight into the Pratt and Whitney outlook on the competition.

Pratt and Whitney identified the different years of Fighter Engine Competition as FEC I, FEC II, ... out through FEC VI, and the follow-on Improved Performance Engine Competition as the IPE. In the late 70's and early 80's when they had all the F-15 and F-16 engine business, Pratt and Whitney was producing about 600 engines per year. They are now down to about 200 engines per year. They are only operating at less than 50 percent production capacity. This is due partly to the Alternate Fighter Engine (AFE) competition, but can also be attributed to reduced federal spending and less engine requirements for the F-15 and international customers. Their hope was that this will be the all time low for production, and that business will pick up from here. The "giving up" of half their business to General Electric has had obvious impacts throughout Pratt and Whitney (2;23).

The general opinion from Pratt and Whitney interviewees was that the Air Force had goals other than those stated publicly in the competition. They believed that thrust was also an issue that would be considered in the source selection, although this was denied by the Air Force. The General Electric engine was known to have a higher thrust output than did Pratt's engine, and the Pratt and Whitney management team felt that this gave General Electric an immediate advantage, and perhaps decisive, in the competition (2;23).

Pratt and Whitney also believed that the decision to split the award was made prior to the start of the source selection, and a 100 percent award was not really possible. The Instructions to the Offeror (ITO) provided to the contractor with the Request for Proposal (RFP), however, allowed for a 100 percent award to one contractor. Unfortunately, Pratt and Whitney geared their proposal for a 'winner take all' award, as they had been producing 100 percent of the fighter engines for the Air Force, and anything less than that was considered a 'loss' by them. Since their offer was structured for a winner take all award, they were hurt by the initial award as was evidenced by the 25 percent award to them (5). As mentioned earlier, they stated that the picture wasn't quite as dismal as it appeared, as other Air Force engine business that was not included in the competition brought them up to about 53 percent of the total fighter engine purchases overall (2;23). Col Drewes stated that this figure was 'approximately 60 percent' (6:134).

Pratt and Whitney identified other goals within their organization, in addition to the Air Force stated goals. Their primary goal was to maintain 100 percent of the fighter engine business. As was stated

above, their plan was to provide the Air Force with such a good deal at 100 percent (and such an unattractive deal for anything less) that the Air Force would not be able to pass up their offer (2). To their obvious consternation this strategy backfired on Pratt and Whitney. Their management elected to take a chance, a calculated risk that made good business sense to them at the time, and they lost (2).

They have since set out to make their organization more efficient in order to enhance their position during future competitions. To accomplish this they have called in an outside firm to look at every aspect of their business through an 'Activity Value Analysis (AVA)' (2). They planned to scrub every function to determine if it was needed as their biggest single cost was the personnel payroll. 'Some jobs (and people) may go' (2).

Pratt and Whitney has had to change internally to adjust to the competition. After they saw the outcome of the initial competition, they started an intensive effort to diversify. Pratt and Whitney did not want to get caught again relying primarily on a single-product line. There were also personnel adjustments within the company in order to get more in line with the Air Force (2).

At first there was some resentment in the company to the approach taken by the Air Force, but once through the initial shock, they realized the position that they had placed the Air Force in prior to the competition. As Pratt and Whitney was a monopoly in the fighter engine business, they had grown to expect all the business and the respect that came with that position. However, they were not being very responsive to the needs of the Air Force. They feel that the competition did get the company's attention, and even if it didn't do anything else, did

make them more responsive to the Air Force needs. The general feeling was that the overall relationship between the contractor and the engine SPO had improved under the competitive environment (2).

This situation motivated Pratt and Whitney to begin trimming their costs and to become more efficient. This has resulted in the loss of some jobs and the company worries that it may have actually gone too far. As the production quantities get smaller, additional improvements in efficiency become more difficult to achieve. They have cut back capacity to become more efficient at current production levels, which may preclude any excess capacity or surge capability. Although efficiency has been actively sought from a cost standpoint, it may not be the most beneficial position for the Air Force. Unfortunately, there is no easy way to estimate the cost associated with surge capability (2;11;23).

The government has obtained many benefits as a result of this competition. The engines are considered to be much better today than in the past and are delivered at a much lower cost. Also, the competition forced the company to trim inefficiencies and operate more effectively, which benefits the government as well as the contractor. Inefficiencies were attacked in a number of ways: 1) The 'value added' by each employee and each job was evaluated and relatively non-productive areas were eliminated, 2) Plant capacity was assessed and opportunities to reduce excess capacity were sought, 3) Make or buy decisions were re-evaluated to assure the most economical choices were being pursued, and 4) A top management decision was made to reinvest corporate money into the modernization of existing facilities (2;11;23).

From a technology standpoint, Pratt and Whitney gained more from General Electric on the Navy F404 effort than through the AFE competition. However, as a general rule, Pratt and Whitney preferred the AFE approach to competition in which each company developed their own technology. The Navy approach took a competitor's technology (General Electric) and handed it over to Pratt and Whitney Aircraft. Although they gained from the Navy experience, they feel that this type of effort discourages contractors from investing in Research and Development (R&D) knowing that they may get only part, or none, of the future production (2;23).

Pratt and Whitney identified a number of problems with the competition, and where possible, offered potential solutions. Pratt and Whitney would like to have seen changes in the program data requirements, but said that this has not happened. They stated that some of the pricing data requirements could have been dropped due to the competition, as the government had received a competitive price. They said that there is no need to audit and analyze what is already known to be the best price available through competition. Pratt and Whitney representatives said they thought it was unnecessary to maintain the bulk of pricing data currently required by the Air Force, which was characterized as being rather substantial (2;23).

The only drawback to this effort as seen by Pratt and Whitney was the fact that they are currently operating at less than 50 percent of their manufacturing capacity. This meant that they were operating at a very inefficient level. In order to adjust to the current level of production, they will have to reduce overall fixed capacity. This will

'trim the fat' and reduce cost, but will also eliminate any surge capability, as mentioned earlier (2;23).

In general, the Pratt and Whitney position was that competition was good, providing we don't try to push it too far. They agreed that the Air Force approach to competition was much better than the Navy leader/follower approach. Their only suggestion to improve on what the Air Force has done was to cut down on the requirements for maintaining pricing data (2;11;23).

Determining when the business base is no longer sufficient to sustain two producers was difficult to determine. None of the representatives seemed to have the answer to this question. Their comment was that from a manufacturing standpoint, they were already below an efficient operating level. They did agree that at some point the decision will have to go 100 percent to one contractor (2;23).

The Pratt and Whitney representatives also stated that the major impact in the future will be in the international market. This area requires close Air Force consideration when making split/award decisions, as the foreign customers watch very closely what the Air Force does in making its buying decisions, then make their buys accordingly (i.e. if Pratt and Whitney is building the engines for all the F-15s and only a small portion of the F-16 engines, and General Electric is doing the majority of F-16 business; then the foreign countries will tend to follow the Air Force lead and order Pratt and Whitney engines for their F-15s and General Electric engines for their F-16s). This would be very detrimental to Pratt and Whitney's future business base, as the F-15 production has been phasing down, and most foreign customers are buying F-16s now (2;11;23).

Note that there is an obvious trade-off here. A classical goal (or expected benefit) of competition is the reduction of prices. However, one of the assumptions for true competition to exist is that suppliers can freely enter and exit the market. That is frequently not the case in the defense sector as the relatively low production volumes, enormous costs, and specialized skills do not support either the ability to enter/exit the market easily or the efficient operation of more than a few companies producing a given item (such as fighter engines, for instance). The trade-off results, then, when one realizes that the government wished both to reduce prices and to enlarge the industrial base for fighter engines. In the defense sector, this trade-off is sometimes difficult to achieve and in some cases may be impossible if production volume is insufficient to economically support more than one supplier.

General Electric

General Electric approached the competition with a completely different philosophy from that of Pratt and Whitney Aircraft. After all, they had been cut out of the competition in the 1960's and this was an opportunity for them to break back into the fighter engine business with the Air Force. As they were on the outside of the business base, looking in, General Electric met the competition with enthusiasm. The representatives interviewed for this study were very cooperative and willing to provide the General Electric view of 'The Great Engine War' (6).

General Electric also had a different approach to the proposal than did their competitor. They set out to win at least some portion of the business, vice Pratt and Whitney's goal of retaining the entire market. They recognized that they faced the 'uphill battle' of trying to get up to 'production speed' quickly and efficiently in order to compete with the fully operational production line of Pratt and Whitney aircraft. General Electric had been concentrating in the commercial sector of the market for so long that they had lost some of their military expertise, and felt they needed to readjust and relearn the business (1;12;17;22).

The 'winner take all' approach of the 1960's had excluded General Electric from the Air Force fighter engine market, and General Electric enthusiastically embraced the AFE competition as their opportunity to reenter that market. They decided to use this opportunity to capitalize on the experience they had gained from their F101 and CFM56 programs and build from the basic engine already in production. This fit right in with General Electric's building block strategy and plans for a spin-off of a derivative engine. One of the issues of the competition, as they saw it, was engine durability. They felt that by using the 'synergy from design improvement, integrity and cost' they could provide a more durable engine and be competitive with the established competition (17).

General Electric was already set up as a matrix organization for both commercial and military applications. This allowed them to schedule and plan their work throughout the organization more effectively. However, as most of their people had primarily been involved in the commercial business, many with no previous military experience, training was required to get personnel into a new mode of thinking. There is a fundamental difference in supporting multiple

engines for a commercial aircraft and a single engine aircraft with a fighter application (12).

In addition to the stated goals of the competition, General Electric had internal goals to balance their commercial and military business. They were looking for another long-term military production run to replace their aging J79 military production line. This competition came along at a most opportune time as far as their corporate philosophy was concerned (1;12;17;22).

This competition fit in well with their plan for a long-term military program, providing continuity that would allow for improvements in product design. Mr. Lyons also said that 'the military provides the stimulus for new product development' (17). As was mentioned by Pratt and Whitney, their concern for attracting the international customers was also voiced (1;12;17;22).

A number of benefits derived from the competition were cited by General Electric interviewees. One manager felt that the competition pushed the entire organization to strive for excellence, and renew their awareness of potential inefficiencies in their business operations. Mr. Lyons concluded that competition had unquestionably improved schedule and cost performance on the program (17).

Another benefit from the competition was that it expanded the market, which was in the best interest of the government and, as mentioned earlier, allowed General Electric to compete in a previously closed market. This competition allowed the government to compete one product (General Electric's engine) against another product (Pratt and Whitney's engine), unlike what the Navy did on the F404 engine contract. The competition as conducted by the Air Force also provided

technological advancement as the two contractors continued competing year-by-year. Obviously General Electric does not wish to lose their new market position. This has motivated them, and the government, to operate more like the commercial market, 'by exploiting their competitor's weaknesses, while pushing their (General Electric's) own superiority' (17).

The general opinion on government/contractor relationships from General Electric was that they have always had a close relationship with the engine System Program Office (SPO) due to their close proximity to Wright-Patterson Air Force Base. However, they did mention that the government is in a better position under a competitive environment to exert pressure on the contractors involved (1;12;17;20).

Contract wording and negotiation has been somewhat of an issue under the competitive environment as the government wanted identical contracts with both contractors. There has been difficulty in getting the wording such that all parties are satisfied. This has required significant interaction and adjustment between organizations. Rather than try to use one Statement of Work (SOW) as the government tried to do, the contractor recommended starting with the same basic SOW and then tailoring it for each contractor (1).

The primary change they would liked to have seen from the competition would be for the government to reduce some of the data requirements. The price disclosure data is very expensive to maintain, and as competition is designed to reduce prices, the requirement for maintaining this data should have been reduced. One interviewee stated that 'when there is a competitor out there that can take your job, you don't need as many checks and balances as you do when you don't have

competition' (12). They have taken the issue of reducing data requirements very seriously and have developed a 'blue ribbon task force' to try and reduce the flow of paper (1). One source felt that the major, and perhaps only, reason that the cost of doing business in the commercial sector is cheaper than in the military sector is due to the government data requirements (1;12;17;22).

To the question of cost impacts and other drawbacks, the contractor provided a unanimous 'no'. Across the board, they all stated that competition is good, as long as the size of the program (quantity of engines in this case) can support competition. To determine when the quantity is too small, the contractor recommended letting the competition go on until such time as the bids returned from the contractors indicate that a sole award is warranted. This would be at the point where the contractors can no longer operate efficiently at such a low quantity of production. They did not indicate that the AFE had reached that point, but stated that eventually they expected the award to go 100 percent to one contractor (1;12;17;22).

There are costs associated with bringing a second contractor on-line, when one contractor is already in production. These initial costs are recouped in time, but the payback period in this case is difficult to determine. One of the problems associated with this type of competition is the difficulty faced by the second contractor trying to get up to speed quickly and efficiently, such that they can compete against a much more mature production line. The follow-on competition with the Improved Performance Engine (IPE) will be a more balanced competition (1;12;17;22).

In order to streamline buying in a competitive situation, the main concern was for limiting data requirements, primarily pricing data requirements. Based on the same concerns voiced by Pratt and Whitney, limiting the auditing requirements and micro-management by the government were also mentioned. The last recommendation toward streamlining the process under a competitive environment related well to the other comments, and that recommendation called for establishing more trust between the government and the contractors. The team spirit and cooperative attitude that would result was considered essential to improving the success of government weapons acquisitions (12).

The representatives from General Electric were all strong advocates of competition. They said that although the costs on this program will not be known for several years, their overall opinion of the competition was one of success. The interviewees welcomed the competition and stated that it should be used on future programs as well (1;12;17;22).

Engine SPO

Initial discussions with personnel from the engine SPO at Wright-Patterson AFB confirmed the interest in and potential value of a follow-on to Col Drewes book, The Air Force and the Great Engine War (6). Formal interviews as well as numerous informal discussions were conducted with SPO personnel to complement information gained through the interviews with industry (18;25).

The SPO supported the stated objectives of the source selection; i.e. to expand the industrial base, to obtain better supportability and durability of the engines, and to improve overall Life Cycle Costs

(LCCs). In addition, they recognized that there were some underlying reasons for the competition, whether stated explicitly or not. As mentioned earlier, Pratt and Whitney had been the sole producer for a number of years and was very comfortable with their position in the Air Force fighter engine market. As they enjoyed this position, they had become somewhat non-responsive to the needs of their customer, the Air Force. So, naturally, one of the informal goals was to 'encourage' Pratt and Whitney to be more responsive. Another purpose behind the effort was for the Air Force to obtain two state-of-the-art advanced engines from the two contractors involved. The general opinion of SPO personnel was that these goals have been satisfied (18;25).

One of the adjustments that had to be made on the government side to satisfy this contracting approach was in the manner the source selection was conducted. Normally, when a source selection is held on a program, the entire program office is totally engulfed in the process. However, in this case, the program office was busy with the day-to-day business transactions. So rather than have the SPO conduct the source selection, supplemented with functional expertise from the staff, this particular source selection was primarily run by the functionals, supported by program office personnel as needed. This concerned some individuals from the program office, as they felt they should have been more heavily involved since they would have to 'live with' the contracts once they were awarded (25).

Stemming from the Competition in Contracting Act (CICA) of 1984, the emphasis on maintaining competition into the production phase of U.S. weapons programs is relatively new. This approach has generally been accepted throughout the DOD, although the application has been

conducted differently by each military service. In the past, the Air Force approach has been to compete multiple contractors and their respective products against each other and generally pick one to continue into full-scale development and production. On the AFE, the Air Force selected both Pratt and Whitney Aircraft and General Electric to continue competing during the production phase for each year's award of fighter engines (18).

SPO personnel felt that both Systems Command (AFSC) and ASD senior management have supported their approach to competition on the AFE program. They have generally accepted the competing of dissimilar products as done on this program, as opposed to the Navy approach of leader/follower as done on the F404 engine. The Air Force approach has also been supported by the user community. The engine SPO has continued to get positive comments on the AFE from both General Russ, the commander of Tactical Air Command, and his predecessor, General Creech. They both expressed feelings that the AFE competition has resulted in a much better engine for the user community (18;25).

There has been some reluctance to accept this concept from Air Force Logistics Command (AFLC). This is due to the inherent logistics problems of introducing two systems into the inventory along with the duplication of support equipment, spare and repair parts, and technical orders. Although this makes the logistics process more complex, the AFLC community has found it to be workable (18;25).

There have been many benefits obtained through the use of competition on the AFE program. One of the benefits identified by the SPO was the improvement in the working relationship between the government and the contractors. The SPO representatives felt that the

use of competition contributed to the overall relationship. They attribute this primarily to the fact that the Air Force now has more power to negotiate with the contractors and feel that the SPO is treated more as a customer who has the option to take their business elsewhere. The relationship between the government and industry's contracting organizations has been somewhat better under the competition, although it has still been difficult to get the contracts negotiated (18;25).

Benefits to the government in the area of supportability have exceeded initial expectations. The Pratt and Whitney -220 engine has exceeded every reliability, maintainability, and durability parameter that was established. The General Electric 110 engine, although not as far down the learning curve as their competitor, has generally also met all reliability, maintainability, and durability expectations, while providing better performance. For example, it has been well published that General Electric has enjoyed a thrust advantage over the Pratt and Whitney engine from the very beginning of the program (18;25).

An estimate of the shop visit rate at maturity (per 1000 engine flight hours) is less than half the rate of the pre-competition engines. The scheduled depot return at initial deployment has increased from 900 cycles to 4000 cycles and the percent of direct labor for scrap, rework, and repair has dropped from the previous rate of 15 to 30 percent to less than 10 percent for both General Electric and Pratt and Whitney Aircraft (18).

As mentioned earlier, the general consensus has been that the Air Force has received better engines at lower costs. The costs of the basic engine has been considerably less in the later years of the

competition. The actual dollar savings are still competition sensitive, but estimated savings have been documented by the engine SPO as follows:

	<u>Savings</u>	
	<u>Acquisition</u>	<u>O&S</u>
1985	1.40	1.42
1986	1.74	1.51
1987	2.10	1.64
1988	2.13	1.68
1989	2.18	1.71

Note: All \$ adjusted to BY83 (\$ in Billions)

The acquisition savings relate to the initial purchase of the basic engine and the O&S savings refer to the estimated life cycle cost savings in operational and support cost. The estimates are based on a total purchase of 1700 engines (18).

In addition to the improved performance of the engines, the Air Force has also obtained significant improvements in the warranty coverage than in the past at a slightly higher cost to the government. The 'old F100' basic engine warranty covered 200 engine flight hours, where the AFE basic engine warranty covered 1000 engine flight hours. The earlier engine warranty on the 'hot section' (turbine) covered 1350 TAC cycles, while the AFE covered 4000 cycles. In other words the Air Force received about a five times improvement in the warranty coverage for about a one to two percent increase in cost (18).

The prime contractors have provided unlimited data access, although there has still been some problems with subcontractor data (less than one percent of the parts have limited rights). Through the use of competition, the Air Force has been able to negotiate more beneficial

contractual terms and conditions than has been possible in the past (18).

The overall change in attitudes from the continued threat of competition has pushed the contractors to treat the Air Force more like their commercial customers. Whether or not the long-term supportability improvement and reduced Life Cycle Cost (LCC) goals will be achieved will not be known until some time in the future (18;25).

The contractors have realized some benefits from this competitive environment as well. They have had to change corporate strategies in order to be more competitive. They have started programs to improve efficiency, upgrade manufacturing facilities, and introduce other capital investments to reduce costs and improve quality. Both contractors have improved their technology and feel that they have better engines to show for their efforts (18;25).

There have been some problems identified from the SPO personnel as well. The one area where there was some concern deals with the contract negotiations. Part of this difficulty stems from the multiple scenarios and Variation in Quantity (VIQ) clauses the contractors were asked to provide in their proposals. In the RFP, the Air Force asked the contractors to submit proposals based on ranges or levels of production, different percentages of award, and various pricing arrangements. This caused the proposals to be very complex, placing an extraordinary workload on the contractors as well as the proposal evaluation and negotiation teams (18;25).

Another problem the government faced from this approach to contracting was the complexity of the beddown process. As was mentioned earlier, a big picture approach is required as this not only concerns

the contractors for the USAF purchases, but also causes significant concern regarding Foreign Military Sales (FMS). The logistics process, as was discussed above, has also been affected by the requirement to support more than one configuration of the aircraft. The competitive pressure has, in the opinion of the contractors, forced them to accept contract clauses and changes that they would not otherwise have agreed to. The use of multiple scenarios has made the proposal, the evaluation, the contract, and the negotiations very complex (18;25).

Although there has been emphasis in the past few years to reduce data requirements, the competitive contracting used for the AFE did not appear to reduce the massive paper requirements levied by the Air Force. There was apparently not enough confidence in the competitive process to relax data requirements. Now that the process has been tried, and confidence has been gained from the AFE, there has been a concerted effort to try to eliminate some of the collection and tracking of pricing data for the follow-on IPE contract (18;25).

Although there were costs associated with establishing a second source, they were minimized on the AFE as the F110 was highly common with the F101, which General Electric was already producing for the Air Force. Both the F110 and the Pratt and Whitney -220 engines were derivative engines, and as such, should not be considered as head-to-head competition in the production of two brand new products. This may have contributed considerably to the success of this competitive effort, which may not be duplicated under another scenario. The savings in setting up a second production line due to the existing family of engines at General Electric would be difficult to determine. The

commonality with engines already in the Air Force inventory also helped to ease the logistics impacts and costs as stated earlier (18;25).

The overwhelming response to the question of the worthiness of this effort has been a unanimous affirmative, with the caveat that the production quantities must be large enough to warrant the dual production effort. As with the contractors, Air Force representatives agreed that there is presently no good method for determining what the lowest cost effective quantity would be; therefore, they agreed with the contractors' recommendation to let the competition continue until the resulting proposals indicate the effort was no longer practical (18;25).

On streamlining the process, the SPO had several recommendations to improve future competition. They agreed with the contractors that minimizing the pricing data requirements would be beneficial. They also agreed with requesting fewer options with the proposals in order to simplify the process; i.e. the Air Force needs to better define their requirements in the future and ask for some reasonable options for Variation in Quantities (VIQs) (18;25).

Another opportunity for streamlining the process dealt with improving the warranties. The warranties used on the AFE were a much needed improvement over what was available in the past, but there was still room for further improvement. The Air Force needs to find a way to simplify the administration of the warranties and the determination of remedies (18;25).

The last recommendation from the SPO was that the yearly award decisions should be delegated from the Air Staff to the product division. This would speed up the process as well as provide the program office with more control of the situation (18).

As far as whether there is still a sufficient business base to continue the dual-award, that was difficult to determine. The quantities in the out years are getting rather small, and at some point a single award is expected. The SPO agreed with the contractors that the upcoming IPE quantities will have to be considered with the AFE along with the impact from the international market (18;25).

V. Summary, Conclusions, and Recommendations

Introduction

This chapter reiterates the purpose of this study and the methodology used in conducting it. The chapter continues by identifying the conclusions and recommendations that resulted from the study. Finally, the chapter concludes with recommendations for further research.

Summary

Competition has long been a widely accepted concept in the business world. Within DOD, the Competition in Contracting Act of 1984 mandated the use of competition for the acquisition of defense weaponry. The competition conducted on the AFE program was one of the Air Force's first attempts at complying with this new approach to contracting. This study was conducted as a follow-on to Col Drewes book, The Air Force and the Great Engine War (6). The purpose of the research was to determine if the approach used on the AFE was successful, and if future attempts should be made to apply this concept to other DOD weapon system contracts.

The method chosen for data collection was personal interviews with knowledgeable individuals from both government and private industry. Interviewees were selected from the Engine SPO at Wright-Patterson AFB OH, Pratt and Whitney Aircraft at West Palm Beach FL, and General Electric in Cincinnati OH. The interview list is provided in Appendix B. Through interviewing individuals from all three organizations

involved in the effort, the interviewer hoped to minimize individual bias in the resulting findings and recommendations.

In order to investigate whether the competition on the AFE program has been successful, the following questions were addressed by the research: 1) What were the desired benefits (goals)? 2) Has the competition been successful; to what extent have the goals been satisfied? 3) Have there been any undesirable 'side-effects'? 4) Does the approach used for the AFE appear promising for other programs? To determine the answer to these questions, the Interview Guide in Appendix A was used during the interview process.

Conclusions

The interviews provided consistent results within each organization, and fairly consistent results across all organizations. The unanimous opinion was that the competition on the AFE was a success. Although each organization recognized the stated goals of the competition, they also identified secondary goals as set by their internal management. All the goals identified, with the exception of one by Pratt and Whitney Aircraft, were achieved during the competition. The one exception was Pratt and Whitney's initial goal of retaining 100 percent of the fighter engine business.

Both formal and informal goals set by the Air Force were satisfied. The Air Force was able to expand the business base by awarding a dual-production contract. They also are getting more reliable engines at lower initial costs, while simultaneously improving the engine warranties. Pratt and Whitney has also improved their responsiveness to the needs of the Air Force.

The contractors were also able to satisfy goals set by their organizations. Pratt and Whitney has improved the efficiency of their organization to enhance their competitive position. They have also started diversifying their products to improve their overall business posture. General Electric was able to reenter the fighter engine market that they had previously been excluded from. They were able to build on their existing engine programs with the derivative engine. This helped them to produce a more durable engine. The AFE award allowed General Electric to balance their military and commercial business. As can be seen, each organization was able to benefit from the competition.

Issues and concerns that have resulted from the competition were also identified through the interviews. As Pratt and Whitney has cut back production to less than 50 percent of their capacity, they have found it more and more difficult to maintain efficiency within the organization. In order to keep the competitive edge, they have looked at the value added by each person and job and cut back those that were not needed. They have also started looking at excess capacity and may cut back fixed capacity to maintain efficiency. This may negatively impact future production and surge capability.

To some extent General Electric had to play 'catch up' to rather quickly become competitive with the more mature Pratt and Whitney production line. They had to conduct an intensive training program to reorient their employees to the requirements of the military fighter engine market. Both contractors identified problems in dealing with the multiple scenario, variation in quantities requested by the Air Force in the proposals. Also, both companies were concerned with the magnitude of the data requirements, particularly in the area of pricing data.

The Engine SPO and both contractors voiced concern about the adequacy of the total business base for supporting the competition in the future. The potential business base includes further purchases of the AFE, future purchases of the 'next generation' Improved Performance Engine, and the Foreign Military Sales market. Two particular issues were raised by the contractors: 1) The pattern of 'FMS' sales frequently conforms to decisions made by the U.S. military. Therefore, both companies are very concerned that if they receive a relatively low percentage of the U.S. purchase, they will also be hurt in the FMS market. 2) Everyone interviewed noted the need for a methodology to determine when the remaining business base no longer economical" supports competition.

There were costs associated with the competition, but circumstances on this program helped to minimize these costs. Both engines were derivatives of earlier engines and the second source being introduced (General Electric) was already in production with the Air Force with another fairly common engine. These circumstances contributed to the success of the competition on the AFE and may not be repeated on other programs.

Recommendations

Competition encourages organizations to operate efficiently and strive for excellence, and as such should be applied to all programs where possible. However, as there is a cost associated with such an effort, the production quantities must be sufficient to economically support two production lines. The recommendation from the interviewees was to continue competition until such time that the competition results

indicate a single award is desired; i.e. let the competition determine when to discontinue the effort. This would be at the point where one contractor does not submit a bid, or where one contractor's bid significantly differs from the other, possibly due to one being unable to economically compete at the given production level.

The second recommendation was to reduce the requirements for pricing data based on the competition. The competitive incentive should be sufficient to bring prices down within a reasonable, competitive range. The requirements for pricing data and audits should not be as critical and massive as levied on non-competitive programs.

The Engine SPO also recommended further research in the warranty area, stating that the administration of the warranties and determination of remedies was still a problem. Their final recommendation deals with the delegation of authority for the yearly award decision to the product division rather than controlling the contracts at the Air Staff.

Competition as conducted on the AFE program appears to be a success. Future programs should be considered on a case-by-case basis to determine if the circumstances surrounding the case and the production quantities are sufficient to warrant competitive production and possible dual-sourcing.

The author offers several recommendations for further research. As the AFE competition is still not complete, another follow-up research effort is recommended for the future. Eventually, the individual efforts can be combined and a longitudinal study completed as encouraged by Lt Col Ronald Calkins (3). Based on the difficulty encountered by the author and the interviewees with the discussion of determining when

the remaining business base is insufficient to continue the competition. further research is needed to develop a methodology for deciding when to discontinue the competition. Also, research is needed to develop an approach for identifying the costs of competition and for comparing these costs to the unit price reductions to see if any net savings are produced by competition.

Appendix A: Interview Guide

Part I: Personal Background

Interviewee: _____

Position Title/Rank: _____

Phone: _____

Years with Company: _____ Years on this Program: _____

Part II: The following questions relate to the Research Questions identified in Chapter 1 of this Thesis:

- 1) What did you see as the goals of competing the AFE contract?
 - purpose behind dual-sourcing
- 2) Did your organization identify any secondary goals?
- 3) What were some of the adjustments that had to be implemented internally to satisfy this change in government contracting?
 - Did Corporate philosophy change? (Managerial Practices?)
 - Were there short-term adjustments?
 - Has this approach been accepted within the organization?
 - Have there been any changes in long range plans?
- 4) How has this affected the government/contractor relationship?
 - more/less alienation
 - encouraged closer working relationship
- 5) Have any significant problems developed due to this change in approach to contracting?
- 6) What benefits have you seen due to this effort?
 - all government
 - any corporate benefits
 - technological impact (attributed to the competition)

7) Do you see any change in program requirements from this approach?

- any changes in data requirements (more/less)

8) What are the cost impacts/other drawbacks?

9) In general, do you see this effort as worthwhile?

- do cost outweigh benefits?

10) Would you recommend this approach for other programs?

- why/why not

11) Do you have any suggestions for ways to streamline competitive buying?

12) Would you say there is still a sufficient business base on this program to keep this effort going?

- how do we determine when not to continue

Part III: General Information

Is there anything else you would like to add?

Do you have any questions that I might answer for you?

Are there any other materials you could recommend that might assist me in this research?

Appendix B: Interview List

Mr. Joel Appling	F110 Business Operations Manager, General Electric, Cincinnati OH.
Mr. Norman Bennett	F100/F-15 Program Manager, Pratt and Whitney Aircraft, West Palm Beach FL.
Capt Mike Iltis	Education with Industry (EWI) student, Pratt and Whitney Aircraft, West Palm Beach FL.
Mr. James Freeman	F110 Engine Program Manager, General Electric, Cincinnati OH.
Mr. Charles Lyons	F110/F16 Program Manager, General Electric, Cincinnati OH.
Mr. Ronald Mutzelburg	Deputy Program Director for Propulsion System Program Office, ASD/YZ, WPAFB OH.
Mr. Paul Simms	F110 Project General Manager, General Electric, Cincinnati OH.
Mr. Roger Skemp	Director of Contracts, Pratt and Whitney Aircraft, West Palm Beach FL.
Mr. Joseph Wood	Director of the Directorate for Strategic Engines, ASD/YZY, WPAFB OH.

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VITA

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The purpose of this study was to provide a case analysis of the Alternate Fighter Engine (AFE) program to determine if competition can be successfully applied to a DOD weapon system acquisition program. The basic question to be answered was, how has the competition between Pratt and Whitney Aircraft and General Electric for the AFE developed and has it been successful?

The research was conducted through personal interviews with knowledgeable individuals from Pratt and Whitney Aircraft, General Electric and the Engine System Program Office (SPO). The interviews provided primary data for analysis, which when combined with available secondary data, presented a complete picture of the case.

The interviews resulted in the identification of benefits and issues that have developed from the competition. The primary benefits were: better responsiveness from the contractor, more reliable engines, better warranties, lower engine cost, and a broader industrial base. The following issues were also identified: less utilization of available production capacity, cutbacks resulting in less surge capability, and difficulty providing proposals with numerous "scenario and quantity requirements".

Finally, recommendations were made for improving the process as follows: Consider AFE buys along with the Improved Performance Engine (IPE) buys to minimize the impact with the Foreign Military Sales (FMS) customers. Reduce the requirements for pricing data whenever competitive pricing has been obtained. Let the competition determine when a single award is more beneficial than continuing the competition.

The competition as conducted on the AFE program provided positive results. The circumstances on this program that led to the success, however, may not be repeated on future applications. The general consensus was that competition into a production program is worthwhile as long as the quantities being produced justify the process.