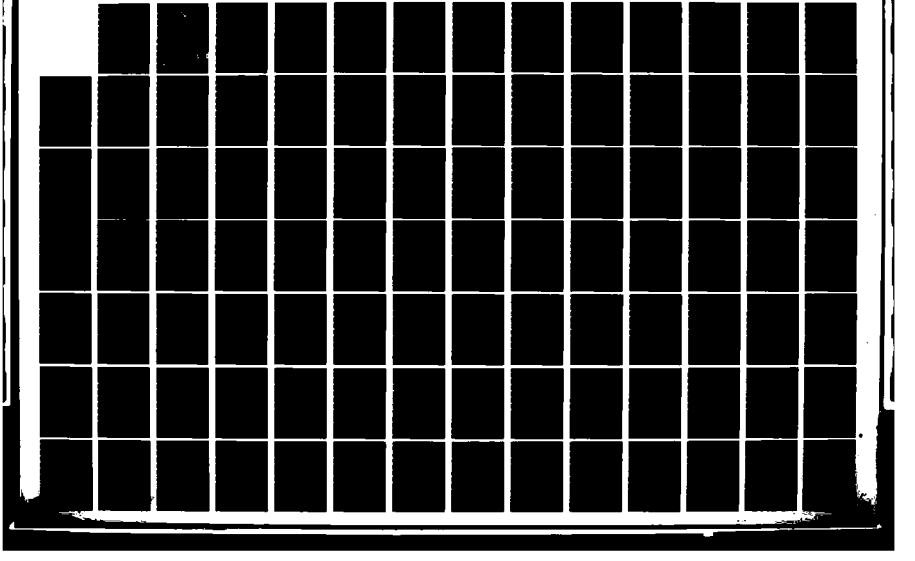
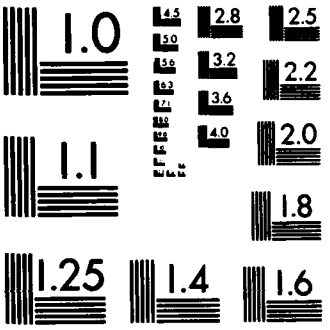
AD-A135 638 MULTIYEAR SUBCONTRACTOR SELECTION CRITERIA ANALYSIS(U) 1/3
AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH SCHOOL
OF SYSTEMS AND LOGISTICS D L GRAY ET AL. SEP 83
UNCLASSIFIED AFIT-LSSR-106-83 F/G 5/1 NL





MULTIYEAR SUBCONTRACTOR SELECTION CRITERIA ANALYSIS

David L. Gray, Captain, USAF
Larry W. Sanders, First Lieutenant, USAF

LSSR 106-83

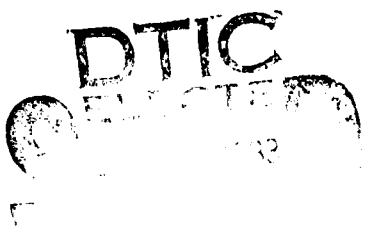
DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY
AIR FORCE INSTITUTE OF TECHNOLOGY

Wright-Patterson Air Force Base, Ohio

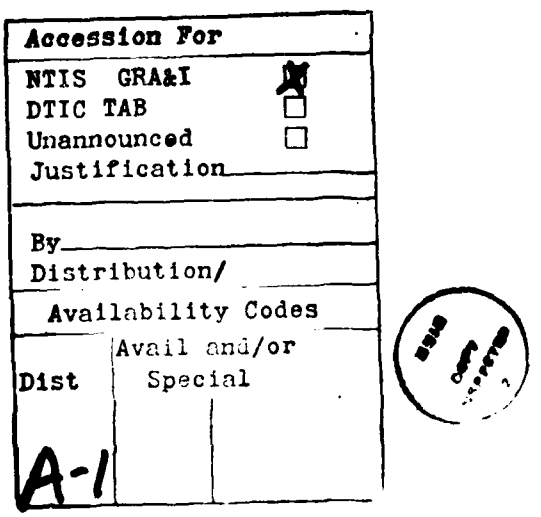
MULTIYEAR SUBCONTRACTOR SELECTION CRITERIA ANALYSIS

David L. Gray, Captain, USAF
Larry W. Sanders, First Lieutenant, USAF

LSSR 106-83



The contents of the document are technically accurate, and no sensitive items, detrimental ideas, or deleterious information are contained therein. Furthermore, the views expressed in the document are those of the author(s) and do not necessarily reflect the views of the School of Systems and Logistics, the Air University, the Air Training Command, the United States Air Force, or the Department of Defense.



UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER: LSSR 106-83	2. GOVT ACCESSION NO.: AD-A135 638
	3. RECIPIENT'S CATALOG NUMBER:
4. TITLE (and Subtitle): MULTIYEAR SUBCONTRACTOR SELECTION CRITERIA ANALYSIS	5. TYPE OF REPORT & PERIOD COVERED: Master's Thesis
	6. PERFORMING ORG. REPORT NUMBER:
7. AUTHOR(s): David L. Gray, Captain, USAF Larry W. Sanders, First Lieutenant, USAF	8. CONTRACT OR GRANT NUMBER(s):
9. PERFORMING ORGANIZATION NAME AND ADDRESS: School of Systems and Logistics Air Force Institute of Technology, WPAFB OH	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS:
11. CONTROLLING OFFICE NAME AND ADDRESS: Department of Communication AFIT/LSH, WPAFB OH 45433	12. REPORT DATE: September 1983
	13. NUMBER OF PAGES: 205
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)	15. SECURITY CLASS. (of this report): UNCLASSIFIED
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE:

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Approved for public release IAW AFR 190-17.

LYNN E. WOLAVER
Dean for Research and Professional Development
Air Force Institute of Technology (ATC)
Wright-Patterson AFB OH 45433

15 SEP 1983

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Multiyear Procurement
Multiyear Selection Criteria
Multiyear Subcontracting
Procurement
Subcontracting

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Thesis Chairman: Donald L. Brechtel, Captain, USAF

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

Multiyear procurement (MYP) has been cited as an acquisition strategy used to check undesirable defense industry trends such as declining productivity, increasing weapon system costs, and declining subcontractor industrial base. The Department of Defense (DOD) has developed criteria for selecting prime contractors for MYP contracts, but no formal selection criteria have been established for selecting MYP subcontractors. The research objectives were to: (1) determine the extent that MYP contracts are used for DOD programs, (2) determine the contract and subcontractor characteristics associated with the use of MYP subcontracts, and (3) determine the selection criteria that contractors consider important when contemplating the placement of MYP subcontracts with subcontractors. Comparative analyses were performed on the rankings of 23 MYP selection criteria among the following groups: (1) MYP experienced versus inexperienced contractors, (2) contractors within different product lines, (3) contractors involved in different production activities, and (4) selection criteria actually used versus selection criteria proposed for future use. The research findings were: (1) MYP is not extensively used for DOD programs, (2) a common set of MYP contract and subcontractor characteristics were identified, and (3) an overall ranking of 23 MYP selection criteria for consideration in placing future MYP subcontracts was developed.

LSSR 106-83

MULTIYEAR SUBCONTRACTOR SELECTION CRITERIA ANALYSIS

A 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

By

David L. Gray, BBA
Captain, USAF

Larry W. Sanders, BS
First Lieutenant, USAF

September 1983

This thesis, written by

Captain David L. Gray

and

First Lieutenant Larry W. Sanders

has been accepted by the undersigned on behalf of the faculty of the School of Systems and Logistics in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE IN LOGISTICS MANAGEMENT
(Contracting and Manufacturing Management Major)

DATE: 28 September 1983

Donald L. Brechtel
COMMITTEE CHAIRMAN

ACKNOWLEDGMENTS

A note of thanks and appreciation is extended to Captain Don Brechtel, our thesis advisor, for his guidance, suggestions, and assistance.

Thanks are also extended to Mr. Jim Williams, Deputy Assistant Secretary of the Air Force, Acquisition Management, for his assistance in obtaining an OMB survey control number, without which this research project would not have been possible.

Special love, appreciation, and deepest gratitude are offered to our wives, Pat and Chris. They have endured a very difficult fifteen months and without their patience, understanding, and moral support, completion of the program would not have been possible.

Thanks are also due to our children, Brian, Shelly, and Teresa, who missed out on their fair share of attention from dad.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

THE RESEARCH PROBLEM

Introduction

The coming of the 1980's has brought with it a renewed emphasis in defense spending. Since the mid-1960's, the Soviet Union has undertaken a massive military buildup that is continuing, unabated, in both nuclear and conventional forces. According to former Deputy Secretary of Defense Frank Carlucci:

> These (Soviet) weapons are not being built for defensive purposes. They are being built to give the Soviets a greater ability to carry out their political aims [6:17].

The aggressive nature of the Soviet Union is clearly evident by the Soviet activities in Poland, Afghanistan, Southeast Asia, and other areas of the world (6:17). It would be very dangerous to assume that, if the Soviet Union attained clear military superiority, the Soviets would not try to exploit military capabilities even more fully than they are now doing (6:20; 30:45).

During the same time frame that the Soviets were allocating resources to build weapons, the United States

(U.S.) has witnessed a progressive decline in defense outlays in relationship to both Gross National Product (GNP) and total Government outlays. Figure 1 illustrates the decline in defense outlays and identifies the main factors which have caused brief departures from the declining trend (17:19).

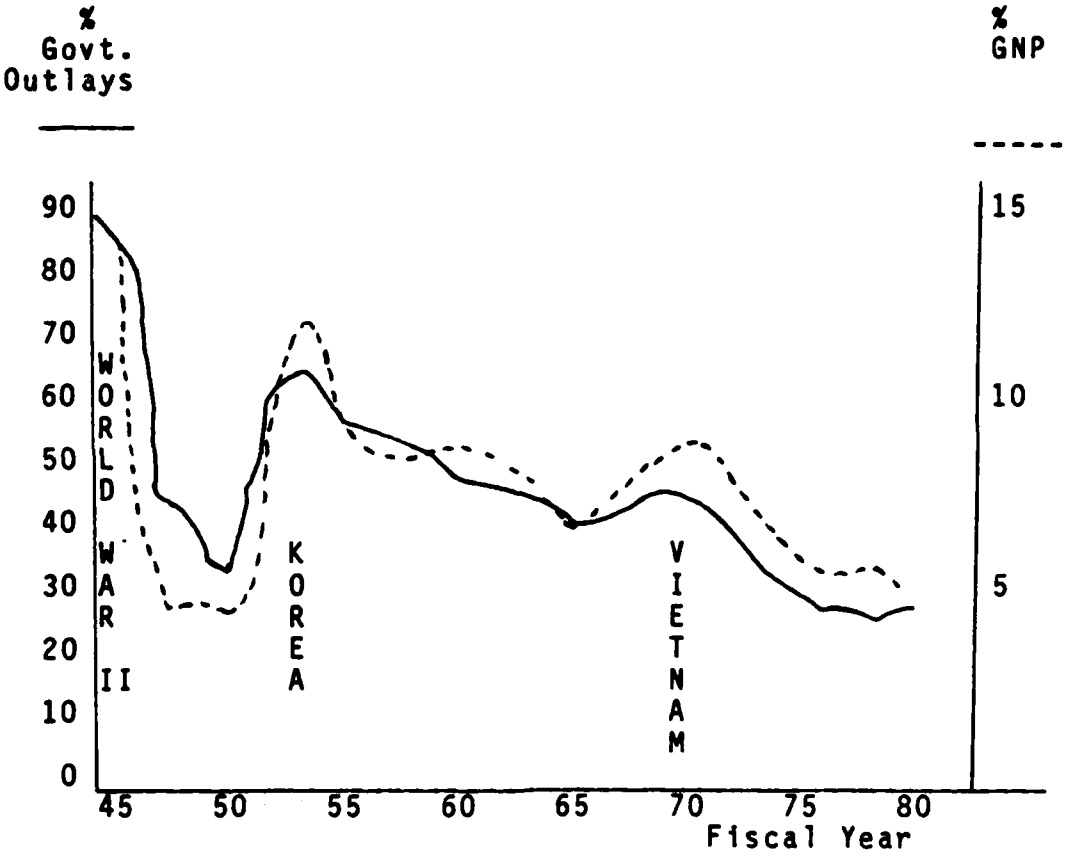


Figure 1

Defense Procurement Since World War II (17:19)

The combination of Soviet buildup and U.S. decline has led to a new emphasis in U.S. military force modernization and readiness. An increase in U.S. defense spending has not been universally accepted, and as history has shown, an upswing in defense spending generally does not last through more than one or two administrations. It is safe to say that the Soviets have and will continue to pump more funds into armament than the United States (30:44). Since it appears that the U.S. populace would not be willing to give up part of its standard of living to further increase the defense budget, the Department of Defense (DOD) must emphasize efficiency in connection with the methods used to acquire defense systems in the future (4:27).

On April 30, 1981, a memorandum entitled "Improving the Acquisition Process" was issued by former Deputy Secretary of Defense Frank Carlucci to each of the military departments. The memorandum was the result of an assessment of the defense acquisition system with the priority objectives of reducing cost, making the acquisition process more efficient, increasing the stability of programs, and decreasing the acquisition time of military hardware (14:1). The 32 acquisition initiatives contained in the memorandum have become known as the DOD Acquisition Improvement Program.

One of the key initiatives of the Acquisition Improvement Program is the use of multiyear procurement (MYP) as a strategy for acquiring major weapon systems. MYP[1] is a generic term describing situations in which the Government contracts, to some degree, for more than the current year's requirement (14:126). MYP is considered one of the most important elements of the DOD Acquisition Improvement Program because of MYP's ability to integrate a number of other major initiatives, particularly the initiatives related to the improvement of the defense industrial base (7:112). In a 1980 Congressional testimony on the capability of the U.S. defense industrial base, General Alton D. Slay, then Commander of the Air Force Systems Command, characterized multiyear procurement as:

> . . . the single most important change we can make to address the defense industrial base problems. It is the key because it attacks so many problems . . . and attacks them so well [35:620].

Problem Statement

The defense industrial production base has been shrinking both in the number of firms producing defense

---

[1] The MYP definition, all other key definitions, and acronyms are found in Appendix A.

related products and the productivity of the firms which remain in the defense industry. A great deal of the decline in the defense industrial base has been attributed to the size and complexity of the defense acquisition process (17:39). The acquisition of major weapon systems has become so regulated and complex that the time required to develop and field today's average weapon system is 7- to 12-years (6:18). The technology associated with new weapon systems is often beyond the state-of-the-art of producing firms. The results of the technology advancement are program instability, higher costs, and increased lead-times. Compounding the instability created by advancing technology are changes in requirements and funding profiles induced by the Government. Program changes have further increased the costs and lead-times associated with weapon system acquisitions (34:117).

The use of MYP to help stimulate the declining defense industrial base is not a new initiative. MYP has been used to acquire specific items or services needed on a repetitive basis since the early 1960's (22:8). Recent research has concentrated on identifying the advantages and disadvantages associated with the use of MYP and the criteria used by the Government to select potential MYP candidates. In the earlier research

projects on MYP, the primary emphasis was on the relationship between the Government and the prime contractor. Very little is known about the applicability of MYP to stimulate subcontractors.

Six criteria have been established by the Government for selection of MYP candidates at the prime contractor level (14:Enclosure 2):

1. Benefit to the Government,
2. Stable requirement,
3. Stable funding,
4. Stable configuration,
5. Cost confidence, and
6. Confidence in the contractor's capability.

The six criteria may also be valid for subcontractor effort on major weapon system acquisitions. However, the criteria for selecting acceptable MYP candidates at the subcontractor level have not been universally defined.

Justification for Research

Previous research projects, conducted to determine the advantages of MYP, have indicated that the Government can expect cost savings from 10 to 20 percent of unit procurement costs (13:3). The cost savings estimate was based on cost avoidance to the Government as a result of using a multiyear contract with the prime contractor. An assumption that is often made is that the prime contractor will use a multiyear contract for many of the

subcontracts on a program. By understanding what criteria contractors consider important when making a decision to use a MYP contract with their subcontractors, the Government should be in a better position to further influence the rebuilding of the defense industrial base by encouraging the use of MYP at the subcontractor level when practical. The identification of MYP criteria for use in selecting MYP subcontractors can also be used to lower acquisition costs through incentives in the prime contract. This research project was designed to identify the criteria that should be used for MYP subcontract decisions to help incorporate MYP incentives into future major weapon system programs.

Research Objectives

The objectives of the authors' research project, with the corresponding research questions for each research objective, are outlined in the following sections.

Research Objective 1

Determine the extent that MYP contracts are used in support of DOD programs.

Research Question 1. What percentage of contractors' sales dollars is obtained through MYP contracts?

Research Question 2. What percentage of contractors' subcontracted effort to lower-tier subcontractors is provided through MYP?

Research Objective 2

Determine the contract and subcontractor characteristics associated with the use of MYP at the subcontractor level.

Research Question 3. What are the characteristics of MYP contracts at the subcontractor level?

Research Question 4. What are the characteristics of subcontractors who receive MYP subcontracts?

Research Objective 3

Determine the selection criteria that contractors consider important when contemplating the placement of MYP subcontracts to lower-tier subcontractors.

Research Question 5. What are the selection criteria that contractors actually used when contemplating the placement of MYP subcontracts to lower-tier subcontractors?

Research Question 6. What are the selection criteria that contractors consider important when contemplating the use of MYP for future subcontracts to lower-tier subcontractors?

Research Question 7. Is there a significant difference in the ranking of the 23 MYP selection criteria actually used by contractors and the ranking of the 23 MYP selection criteria the same contractors identified for future use?

Research Question 8. Is there a significant difference in the rankings for the 23 MYP selection criteria proposed for future use by MYP experienced and MYP inexperienced contractors?

Research Question 9. Is there a significant difference in the rankings for the 23 MYP selection criteria among contractors having different product lines or production activities?

Summary

Chapter I, the Research Problem, presented a statement of the research problem, background information, justification for the research effort, the research objectives, and the research questions for the authors' study.

The research problem involved the criteria used by contractors in selecting lower-tier subcontractors for MYP subcontracts. MYP has been used since the early 1960's to stimulate the defense industry by acquiring specific items or services. Recent research projects

have identified the advantages and disadvantages of MYP as well as the criteria used by the Government for selecting potential MYP candidates.

This research study was undertaken to determine what criteria contractors considered important when selecting lower-tier subcontractors for MYP subcontracts. Other objectives included determining the extent that MYP contracts are used in support of DOD programs and determining the characteristics of MYP contracts and subcontractors at the lower-tier subcontractor level.

To serve as the basic framework for the research effort, a review of the literature was conducted. Chapter II, Literature Review, presents the results of an examination of relevant literature on the subject of MYP.

CHAPTER II

LITERATURE REVIEW

Introduction

Chapter I, The Research Problem, outlined the problem for the research study and briefly described the topic of MYP. This chapter provides the background associated with the use of MYP for the acquisition of major weapon systems. The MYP Literature Review Plan (Figure 2) serves as the overall outline for the review of the relevant literature for the authors' research project. The review of the literature begins with a brief discussion of the defense industrial base and culminates with a description of the current subcontractor use of MYP. Other topics addressed in the review of the literature include a discussion of the weapon systems acquisition process and the characteristics, advantages, disadvantages, and MYP selection criteria associated with the Government's use of multi-year procurement.

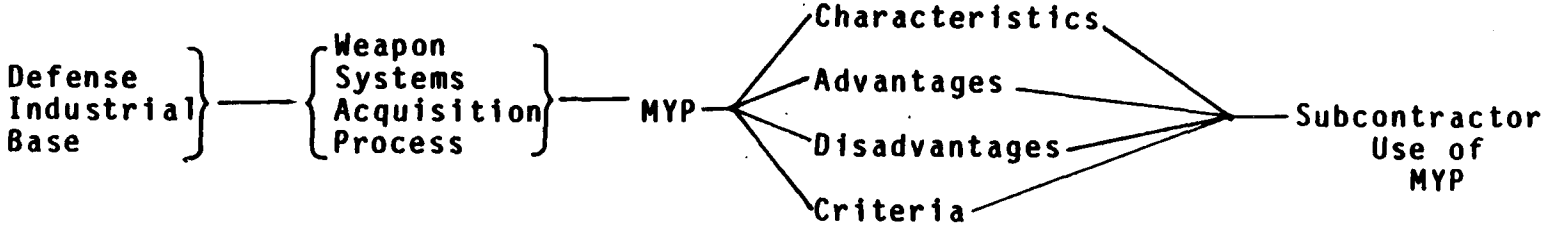


Figure 2

MYP Literature Review Plan

Defense Industrial Base

Two centuries ago weapon systems production was simplistic, with little attention given to the defense industrial base. The defense industrial base, a mix of Government and contractor-owned facilities, dealt with a relatively stable technology and minimal capital investment needs (22:7). Today, the U.S. defense industry has grown to encompass an extensive network of prime contractors, subcontractors, suppliers, and vendors interwoven into a highly complex market structure as shown in Figure 3 (17:3). The players within the defense industrial complex are constantly faced with seemingly insurmountable financial, technological, marketing, and political barriers which discourage free entry and/or exit from the defense marketplace and sometimes drive smaller firms out of business (17:46).

Technology is advancing at an ever increasing pace, demanding higher performance and larger amounts of engineering and scientific skills (17:51). Capital investment requirements for weapon systems production have also skyrocketed, sometimes exceeding tens of millions of dollars. Combined with critical material shortages,

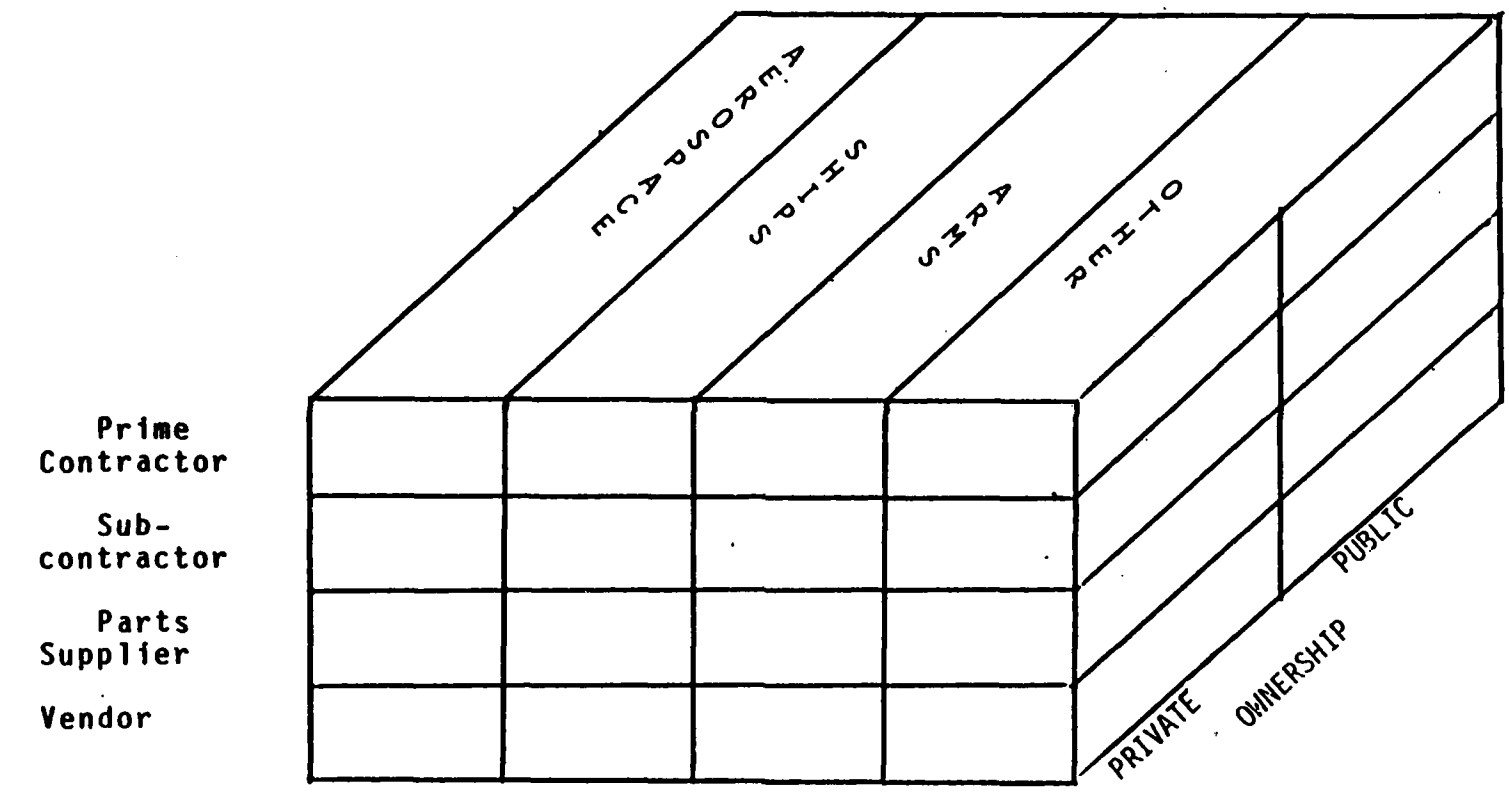


Figure 3

The Composition of the Defense Industry (17:3)

long lead-times, inflation, and compressed surge requirements, the previously mentioned factors have stunted the productivity growth within the defense industrial base (23:8).

Weapon Systems Acquisition Process

Adding to the external factors mentioned above, the weapon systems acquisition process tends to retard productivity advancements by its very nature (29:1). The 7- to 12-year program acquisition cycle for major systems might appear to give a contractor sufficient time to make long-term plans for capital improvements to meet the needs of a new program. In reality, the acquisition cycle duration has just the opposite impact because of the instability created by the single-year contracting and funding methods which are used by the Government (1:155).

A prime example is the acquisition of any major weapon system not using MYP. The Government provides the contractor with an estimate of the total number of weapons for a particular system, which the Government expects to buy throughout the life of the program. However, the Government only commits (through a contract with the business firm) to purchase a portion of the total number of that particular weapon system in any one

year. If the contractor relies upon the Government's original estimate and makes major capital investments in plant and equipment, the contractor could incur major financial losses if the Government reduces the original estimate or cancels the program. For this reason, the defense contractor has a real incentive to look at short-term requirements only (17:48).

Weapons acquisition history is full of cases of program cancellations and instability which make long-term planning virtually impossible (23:1; 1:152; 6:56). The instability is the result of many factors both within and outside the control of the weapon systems acquisition process. Table 1 provides a partial list of factors that potentially may cause program instability for defense acquisitions. Although many of the potential causes could be classified as either being within or outside acquisition control, it should be recognized that the ultimate control of defense program stability rests with Congress through the control of funds (1:155).

The effects of program instability often culminate in the rising costs associated with the acquisition of major weapon systems (23:5). The cost estimation track record, reflecting the percentage of major DOD programs

which have experienced cost overruns since 1950, indicates that the probability of a major program being completed within the initial cost estimate is only about nine percent (4:27). Statistically, 91 percent of all new DOD programs may experience some form of cost overrun. With defense needs rising and the percentage of defense outlays declining, some means of interjecting stability into the acquisition process is necessary to help prevent cost overruns on future defense programs. Multiyear procurement (MYP) has been identified as one approach to introduce stability into major DOD weapon systems program management (1:148).

Table 1

Factors Affecting Program Stability

STABILITY FACTORS	AFFECTS
Changes in:	
Economic Conditions	Budget
Quantity	Capital Investment
Schedule	Manpower/Skill Training
Configuration	Modernization
Requirements	Readiness
Quality	Price/Cost
Support	Life Cycle Cost
Funding	Liquidity

MYP Characteristics

The method most often used to acquire major weapon systems is single-year procurement (9:39). Requirements are identified based on a need associated with a specific year, and a contract is written to cover only the quantities necessary to fulfill that year's requirement. The annual contracting method of procurement has always been supported by Congress, because the single-year approach provides Congress with the maximum control over defense expenditures. Congress' main concern has been to avoid committing future administrations to specific weapon system programs (9:45). By controlling defense expenditures using single-year procurement practices, further instability has been introduced into the weapon systems acquisition process. The instability has created an environment which is not conducive to stimulation of capital investments and which discourages defense contractors from devoting resources to enhance productivity over a long-term production program (29:5).

To counter the instability problems and other problems related to the declining defense industrial base, MYP was introduced as a method to motivate defense contractors to harness resources towards enhancing productivity on defense programs. The Government's

commitment to a long-term contract (e.g., three to five years) should provide incentives for the contractor to invest in laborsaving facilities, purchase components and raw materials in economic quantities to reduce lead-times and promote savings, and perform assembly and sub-contracting in the most efficient and economical manner (29:6).

Recent passage of the 1982 DOD Authorization Act[2] signified Congressional support for the use of MYP as a means of stimulating the defense industrial base. The Act provides for: (1) MYP use on major systems acquisitions; (2) the use of advance procurements to obtain economic lot prices; (3) inclusion of recurring costs in the cancellation ceiling; and (4) an increase in the cancellation ceiling from $5 million to $100 million. The four changes have eliminated most of the barriers which discouraged the use of MYP on major system acquisitions in the past (1:129; 23:62).

Although the passage of the 1982 DOD Authorization Act increased the cancellation ceiling from $5 million to $100 million, later legislative actions retightened the approval requirements for termination ceilings in

---

[2] Also known as Public Law 97-86, dated December 1, 1981.

order for Congress to regain funding control of MYP (36:99). The 1983 DOD Appropriations Bill, as modified by Amendment Number 8, requires that Congress be notified of any MYP contractual action which includes any economic order quantity (EOQ) procurement or which includes an unfunded contingent liability in excess of $20 million (36:33). Since a significant portion of MYP savings are dependent upon the use of EOQ, the tighter Congressional approval requirements virtually eliminated the benefits that the increased cancellation ceiling originally provided (16).

Current Defense Acquisition Regulation (DAR) policy encourages the use of MYP to take advantage of one or more of the following situations (37:Section 1-322.1):

1. Lower costs;
2. Enhancement of standardization;
3. Reduction of administrative burden in the placement and administration of contracts;
4. Substantial continuity of production or performance, thus avoiding annual start up costs, preproduction testing costs, make-ready expenses, and phaseout costs;
5. Stabilization of work forces;
6. Avoidance of the need for establishing and "proving out" quality control techniques and procedures for a new contract each year;
7. Broadening the competitive base with opportunity for participation by firms not otherwise willing or able to compete for lesser quantities, particularly in cases involving high start up costs; and
8. Implementation of the Industrial Preparedness Program for planned items with planned producers.

Each of the above situations involves a direct or indirect cost savings to the Government.

MYP Advantages

A number of advantages have been identified with the use of MYP on major defense acquisitions. Each one of the advantages supports the fundamental quest of enhancing the defense industrial base, as outlined by former Deputy Secretary Carlucci in the DOD Acquisition Improvement Program guidelines. The advantages of MYP benefit both the Government and the defense contractors, making MYP an important tool for stimulating the entire defense industry (23:61).

One of the primary benefits of MYP is cost savings, estimated to be between 10 and 20 percent of unit procurement costs (31:22). The MYP savings projection results from the contractor's ability to predict future program needs, allowing the contractor to plan material and component purchases to take advantage of economic order quantities (9:43; 13:3; 23:55; 31:23). Under single-year procurement practices, a contractor limits the purchase of materials to a single-year's requirement regardless of the price breaks that are possible by

ordering larger quantities in each individual procurement. To order beyond the single-year's requirement increases the contractor's risk of loss if the program is cancelled before the materials are used. Under the basic single-year contract, the Government does not reimburse the contractor for materials which support future production contracts (7:115).

A second advantage realized from MYP is the ability of the contractor to recoup start up and capital investment costs over a three- to five-year period instead of in a single year. The multiyear recoupment of investments encourages the contractor to take advantage of the stability created by a long-term contract to invest in laborsaving machinery and other productivity investments. The MYP recoupment opportunity also creates stability in the work force, which encourages the contractor to better train and equip workers. The Government and the contractor ultimately benefit from the investments, because costs and defects are reduced, and the quality of the output (weapon systems) is increased (32:9; 23:55).

In addition to the potential cost savings and the increased ability to plan and implement good investment opportunities, MYP supports a number of other Government acquisition initiatives. Due to the stability created

by MYP, more businesses should be willing to participate in defense contracts. The entry of additional firms into the defense marketplace would stimulate competition at the prime and subcontractor levels and ultimately reduce acquisition costs (13:9; 23:55). The increased use of MYP should also strengthen the defense industrial base creating long-term productivity growth, reduction of procurement lead-times, and improved industrial surge capability (23:55).

MYP Disadvantages

Over the years that MYP has been used as an acquisition technique, a number of problems have been identified with the use of MYP. As mentioned previously, Congress is very concerned that the widespread implementation of MYP may create a shift of acquisition power from Congress to the Executive Branch of the U.S. Government. Congress has always maintained control over the expenditure of funds, and the use of MYP causes Congress to relinquish some of the monetary control over defense programs (7:118). There is concern that relinquishing some of Congress' funding power eliminates some of the checks and balances which have been built into the defense acquisition process. The shift in funding

power has the potential of reducing Congressional influence over Executive Branch decisions (7:118; 24:10).

One of the key disadvantages of MYP is the loss of flexibility in the overall acquisition process. The decision to utilize MYP on a major weapon system program brings with it a commitment by the Government to purchase a specified number of end items over a three- to five-year period. MYP gives the contractor the authority to purchase components and materials in economic lots before the items are actually needed, as long as the cancellation ceiling specified in the contract is not exceeded. The MYP authority must carry with it a great deal of stability in the funding, configuration, and delivery requirements for the total program (23:57). If the requirements change drastically during the life of the program, the Government may be faced with increased costs, delays in the delivery schedule, or cancellation costs associated with termination of the contract. A program decision to make a needed configuration change could be intentionally overlooked because of the adverse political and media interest which would be generated by the increased costs associated with the change in requirements (32:10).

A disadvantage and key issue which concerns the Department of Defense (DOD) is the effect of the "funding bow wave" associated with a MYP program on other major programs. The term "funding bow wave" is concerned with the added funding requirements for a major weapon system in the first two years of the MYP acquisition. The bow wave occurs because of the need to fund the MYP contractor in the early stages of the program in order for the contractor to take advantage of economic order quantity buys. Although the overall funding requirement for the program does not change because of the bow wave, the need for more funds in the earlier stages of the program might drive the DOD budget high enough to preclude the start of other needed programs (7:117).

Funding for the first year of a MYP contract varies depending on the type of funding used. Some supporters of MYP[3] feel that all MYP contracts should be fully funded, meaning that the total contract price for all end items should be appropriated in the first year. The full funding policy would needlessly tie up approximately 40 percent more funds than are necessary to

---

[3] A glossary of key MYP terms and definitions is provided in Appendix A.

achieve the savings MYP has to offer (26:14). Tying up the large amount of money on a single program would definitely limit the number of major programs which could be initiated in a single year.

Funding up to termination liability (i.e., appropriating funds for the first year's requirement and advance buys) has been proposed as an alternative to the full funding policy. Appropriating only the funds required to support the termination liability provides the opportunity to utilize the additional funds which would have been required under the full funding method to support other needed programs. This alternative funding method is more realistic than the full funding method but also contains a "funding bow wave" which must be considered in relationship to the need for other programs and the potential savings MYP can generate (7:117).

MYP Criteria

The Government criteria used to evaluate potential MYP programs can be classified as a cost/benefit analysis which requires management judgment to determine if a proposed program should be considered for MYP. The evaluation criteria have been divided into six separate

categories and are discussed in the following sections (7:129; 9:49; 23:57; 14:Enclosure 2).

Benefit to the Government

The most important criterion to be considered when evaluating a potential MYP program is the estimated benefit to the Government. This first criterion does not mean that the other criteria are not important, because the assignment of Government benefits from MYP must be undertaken in conjunction with the evaluation of all other criteria as a single package. However, if MYP will not yield substantial cost avoidance (savings) or other benefits when compared to conventional single-year contracting methods, then MYP should not be considered for the acquisition program. Cost avoidance is probably the most significant benefit of MYP, but improved delivery and a significant enhancement of the defense industrial base are also benefits which should be considered. If possible, the benefits associated with MYP should be quantified.

Stable Requirement

The stability of the program is of prime importance when considering a multiyear contract, since MYP commits the Government for more than one year. If the program

is controversial or in the design or early stages of production, there is a good chance that the production rates, fiscal phasing, or total program requirements will not be firm. When using MYP, it is imperative that the program be stable and that the production item be firmly established. It may be necessary to begin production under a single-year contract and delay the use of a MYP contract until the production of the item becomes more stable.

Stable Funding

Before a MYP contract is issued, there should be some reasonable expectation that the program will be funded at the required level throughout the entire contract period. If for some reason the funding profile does not appear stable, the Government could be faced with a very large program cancellation cost. One good measure of funding stability is the inclusion of the required funding profile for a program in the five year defense program (FYDP) prior to the award of a contract.

Stable Configuration

To have a stable configuration, the proposed MYP program must be in the production/deployment phase of

the DOD acquisition cycle. The technical requirements of the production item must be stable with relatively few design changes anticipated. Although some changes may occur, the changes should not affect the overall cost of the program, pushing the cost beyond the proposed funding profile.

Cost Confidence

The contractor's cost estimate and the estimated cost benefits to the Government should be derived and verified with enough confidence to warrant the use of a fixed price contract. The cost estimates should be based on historical data from the same or similar items or by some proven cost estimating technique.

Confidence in the Contractor's Capability

The potential contractor should have enough technical knowledge and capability to successfully perform the MYP contract. The capability requirement does not mean that the contractor must have produced the item previously. It is only necessary for the contractor to have the verified capability.

The use of the above criteria is essential for decision makers to adequately evaluate proposed MYP

programs. If a program is deficient in any of the stability or confidence criteria, a thorough analysis of the cost/benefit trade-offs associated with the program must be made to determine if the risks are acceptable in relation to the estimated benefits (1:129).

Subcontractor Use of MYP

Subcontractors within the defense industrial base are generally characterized as having lower profits and lower return on investments than prime contractors (18:138). The subcontractor is often not able to withstand the instability associated with producing for the Government and must drop out of the defense marketplace. As a result, the number of lower-tier subcontractors has been declining (18:143).

The use of MYP for effort being subcontracted to lower-tier subcontractors has been proposed to help counteract the erosion of the defense industrial base at the subcontractor level (7:121). The available MYP literature generally considers that the advantages and disadvantages of MYP and the criteria used to select lower-tier subcontractors for MYP use are similar to the advantages, disadvantages, and criteria associated with MYP use at the prime contractor level (24:22; 37:Section 1-322.1; 16).

The Defense Acquisition Regulation (DAR) policy concerning the use of MYP for subcontracted effort states that MYP should be encouraged when: (1) the subcontract item or service is of stable design and specification; (2) the quantity required is reasonably firm and continuing; (3) effective competition is assured; and (4) the use of multiyear contracts can reasonably be expected to result in reduced prices (37:1-322.1(f)). These four criteria parallel the criteria identified for use with MYP between the Government and a prime contractor.

Although DAR identifies similar criteria for MYP use when dealing with prime contractors and subcontractors, the relationships between the prime contractor and subcontractors differ from the relationship between the Government and the prime contractor. The differences are supported by the fact that the procurement practices used between the prime contractor and subcontractors are not necessarily consistent with the procurement practices used between the Government and the prime contractor (17:146).

A MYP study conducted at the subcontractor level by the Logistics Management Institute (LMI) outlined four potential contract scenarios which could exist between the Government and the prime contractor (24:8). The LMI

study analyzed the following contract scenarios to determine the effects of the use of MYP at the subcontractor level: (1) Multiyear Prime - Competitive, (2) Single-Year Prime - Competitive, (3) Multiyear Prime - Noncompetitive, and (4) Single-Year Prime - Noncompetitive. The results indicated that the contract relationship between the Government and the prime contractor directly influenced the use of MYP at the subcontractor level.

The determining factor in the Logistics Management Institute study appeared to be the presence of competition at the prime contractor level (24:29). Where competition was present at the prime contractor level, the prime contractor had an incentive to utilize the most cost beneficial contracting method to subcontract to lower-tier subcontractors. When competition was present, the Government's role was identified as an informer to insure the prime contractor was made aware of the advantages and disadvantages of MYP (24:9). It was left up to the prime contractor to determine when it was appropriate to utilize MYP.

When dealing with a sole source prime contractor, the Government's role changed. The sole source contractor did not have the incentive to hold costs to a minimum (24:9). For this reason, the Government's role was

identified as one of providing the incentive to utilize MYP with subcontractors when it was appropriate.

Summary

Chapter II, Literature Review, presented the results of an examination of the literature on the subject of MYP. The use of MYP to strengthen the defense industrial base was discussed. Throughout the discussion, the advantages and disadvantages of MYP use and the Government criteria for selecting potential MYP candidates were highlighted. Finally, the application of MYP to subcontracted effort was presented to identify the relationships between the Government, the prime contractor, and subcontractors.

The authors' research project was designed to identify the criteria used by contractors when considering lower-tier subcontractors for MYP use. Chapter III presents a detailed discussion of the research methodology used to accomplish the research objectives formulated in Chapter I.

CHAPTER III

RESEARCH METHODOLOGY

Introduction

The overall objective of the authors' research project was to determine the criteria that are being used by defense contractors to subcontract work to lower-tier subcontractors using multiyear procurement (MYP). The previous two chapters described the research problem and reviewed the current literature associated with the use of multiyear procurement (MYP) for DOD programs. This chapter explains the research methodology used to accomplish the research objectives and answer the associated research questions. Chapter III addresses the data collection process and the data analysis techniques used to answer each research question.

Figure 4 outlines the research flow process used for the authors' research project. The overall research design was structured in two phases (Phases I and II).

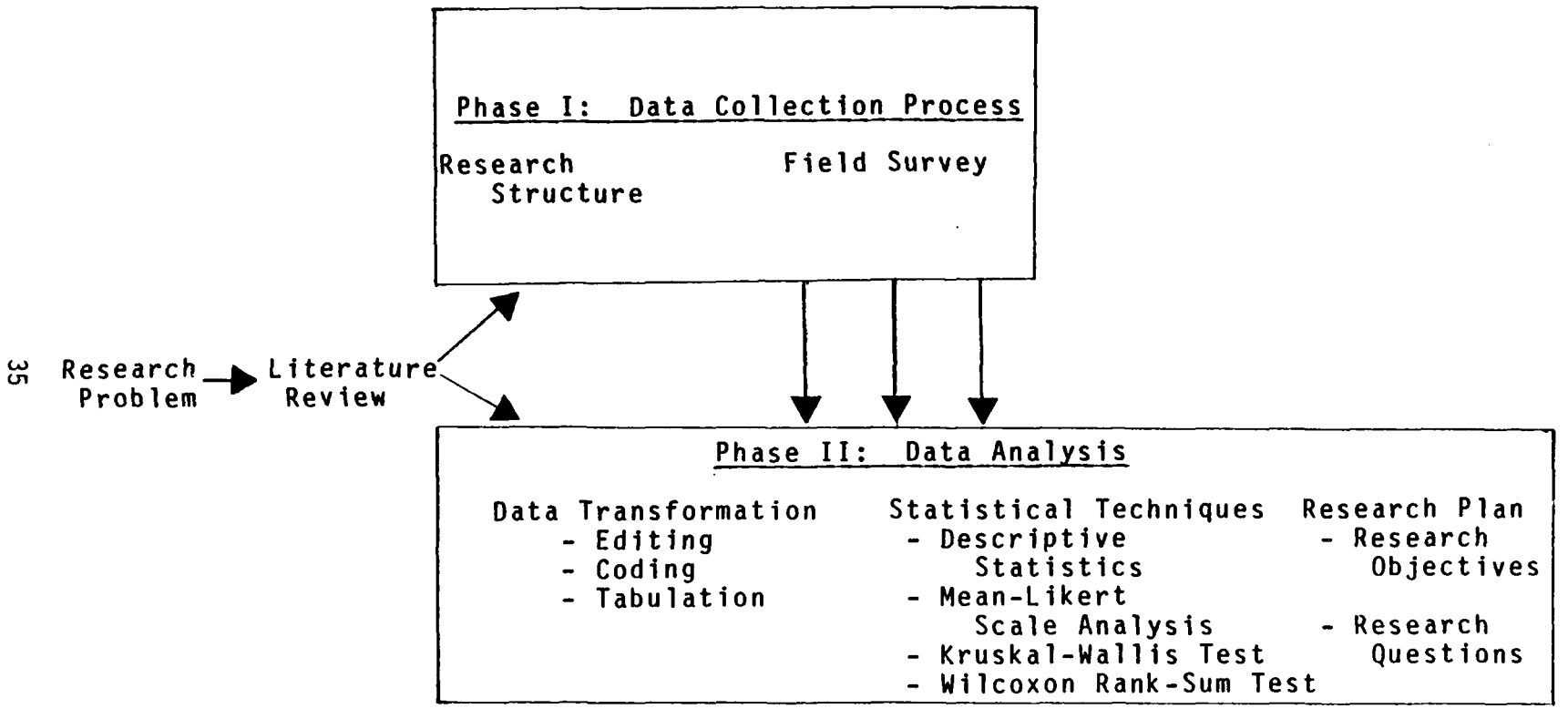


Figure 4

The Research Flow Process

The research flow began with a field survey of contractor personnel (Phase I) and ended with statistical analysis and interpretation of the data collected (Phase II).

Data Collection Process

The method used to collect data for the research project was a field survey of defense contractor management personnel. The survey offered access to a broad range of opinions about the criteria that prime contractors and subcontractors use in selecting lower-tier subcontractors as MYP candidates.

Research Structure

The structure for the field survey was a sample of defense contractors who have produced goods or services in support of Air Force weapon system program(s). The following discussion identifies the universe, population of interest, and sample selection used for the research project.

Universe Description. Since MYP can be used by any prime contractor or subcontractor that manufactures components which are ultimately used in a major weapon system, the universe for the authors' research project

consisted of all firms within the defense industrial base. Figure 3, page 15, outlines the composition of the defense industrial base as consisting of prime contractors, subcontractors, parts' suppliers, and vendors who produce goods and services which ultimately become part of a DOD product.

Population of Interest. The population of interest for the authors' research project consisted of all contractors within the defense industrial base which produced goods or services ultimately used in Air Force weapon systems. The population of interest included contractors from all tiers of the defense industrial base. Although the population of interest was limited to contractors supporting Air Force programs, a great deal of commonality exists among the contractors supporting weapon system programs for all military services.

Sample Selection. The following formula was utilized to determine an acceptable sample size (25:867):

$$n = \frac{z^2\sigma^2}{B^2}$$

where:

n = Sample size
σ = Population standard deviation.
z = Z-score based on desired confidence level.
B = Acceptable tolerance error level.

The elements used to calculate an acceptable sample size included an approximated standard deviation (σ) of 1.5 computed by dividing the response range by four (25:318), a 95 percent confidence level, and an acceptable tolerance error level of 20 percent. The desired confidence level of 95 percent and tolerance error level of 20 percent were selected in order to support the need to make interpretations and infe es from the survey results. An acceptable sample s as calculated with the foregoing formula was as follows:

$$n = \frac{(1.96)^2(1.5)^2}{(.2)^2} = 216.$$

A low response rate of 40 percent was anticipated due to the following: (1) the length of the survey instrument, (2) the complexity involved in responding to some survey questions, and (3) the political nature of the cost-related questions contained in the survey instrument. The research sample was selected by surveying five functional management areas within 110 defense contractors. The sample of 110 defense contractors was chosen based on the potential of receiving a total of 550 survey responses. Since a 40 percent response rate was anticipated (i.e., .40 x 550 = 220 anticipated responses), the researchers considered the responses from

110 defense contractors to be acceptable (i.e., greater than the calculated acceptable sample size of 216).

Two survey questionnaires were sent to each vice president for the five functional areas within the 110 firms surveyed. The five functional areas were Manufacturing/Operations Management, Financial Management, Contract Management, Subcontract Management/Materials Management, and Marketing. Two survey instruments were sent to each one of the functional areas in an attempt to increase the response rate. To eliminate duplicate responses from a functional area within a particular firm, the most complete survey instrument was selected for data analysis.

The reference sources used in selecting the research sample for the authors' research included:

1. World Aviation Directory (12),
2. Compendium of Depot Maintenance Contractors (3),
3. Fiscal year 1982, 1983, and 1984 proposed MYP programs (7:127-128;38),
4. Contractors participating in the DOD subcontracting program (15), and
5. Major subcontractors for the B-1B, F-16, and other Air Force major weapon system programs.

A criterion of $1 million or more of outstanding Government contracts for fiscal year (FY) 1982 (as of 1 September 1982) was established for sample selection. The researchers felt that the contractors who had participated in defense procurement actions of $1 million

or more would be more knowledgeable of Government contracting practices and would have a better understanding of multiyear procurement (MYP).

Field Survey

The field survey questionnaire used to collect data for the authors' research project consisted of three sections. A copy of the entire survey instrument is provided as Appendix B. Section I of the field survey instrument sought demographic information about the firms and the respondents. The demographic information included the type of industry, production activity, product line, and size of the firm. Section I of the survey instrument also requested the management level and experience level of the respondents. The demographic information was used to provide face validity for the survey results and to perform data analyses comparing the opinions of various demographic categories.

Section II of the survey instrument involved the MYP criteria actually used to select potential MYP subcontractors by firms experienced in some aspect of MYP. Contractors were classified as experienced in MYP if (1) the contractor had participated in a MYP contract in the past, (2) the contractor had submitted a MYP cost or technical proposal for a major weapon system, or (3) the

contractor had actually used a MYP contract for sub-contracted effort to a lower-tier subcontractor.

Experienced MYP respondents were asked to complete survey questions describing the contractual arrangements and the characteristics of the subcontractor firms that actually received a MYP subcontract. The experienced MYP respondents were also asked to use a seven-point Likert scale to describe the amount of consideration that was actually given to 23 MYP selection criteria during the planning phase of MYP subcontracted efforts. The 23 MYP selection criteria are:

1. Must be in Support of an Ongoing MYP Contract,
2. Advance Government Funding,
3. Economic Order Quantity Application,
4. Past Performance of Subcontractor,
5. Amount of Cost Savings Expected,
6. Potential for Advance Buys,
7. Number of Potential Competitors,
8. Subcontractor's Production Capacity,
9. Shelf Life of the Subcontracted Item,
10. Amount of Termination Liability Your Firm Must Assume,
11. Your Firm's Storage Capacity,
12. Production Quantities are Stable,
13. Degree of Funding Stability,
14. Degree of Configuration Stability,
15. Dollar Size of Subcontract Effort,
16. Funding Needs of the Subcontractor,
17. Length of the Subcontract Effort,
18. Complexity of Technology,
19. Availability of Multiyear Funding,
20. Experience Level of Subcontractor,
21. Industry Product Line of Subcontract Effort,
22. Capital Investment Commitments by Subcontractors, and
23. The Number of Shipsets per Production Lot.

The 23 MYP selection criteria were chosen for analysis, because the 23 criteria were considered to have the greatest potential impact on the decision to use a MYP contract for subcontractors. Each criterion is identified and operationally defined in Appendix C. The 23 MYP selection criteria were developed from a review of MYP literature and the criteria identified in the Defense Acquisition Regulation (37:Section 1-322.1).

The field survey questions containing the 23 MYP selection criteria used an ordinal rating scale and were open-ended, so that the respondents could add any criteria that were actually used but not listed among the original 23 criteria. A seven-point Likert scale was chosen, because the seven-point scale offered more reliability than smaller scales and less complexity than larger scales (26:595-596). The response categories for the seven-point Likert scale were established as outlined in Table 2.

Section III of the survey instrument requested all respondents (experienced and inexperienced) to describe the amount of consideration that should be given to the 23 MYP selection criteria in the future. Respondents were asked to utilize the aforementioned seven-point

Likert scale and were given an additional section to include any other criteria and corresponding seven-point rating.

Table 2

Likert Scale Ranks and Corresponding Descriptions

Likert Rank	Description
1	Not a Consideration at All
2	Very Weak Consideration
3	Weak Consideration
4	Considered
5	Strong Consideration
6	Very Strong Consideration
7	Mandatory Consideration

Data Analysis

The analysis of the data (Phase II of the research project) was accomplished by using the S statistical data analysis package (5). The data analysis consisted of the transformation and coding of data, statistical analyses, and interpretation of the results.

Data Transformation

The use of the Likert scale generally assumes that the respondent to the questionnaire considered the intervals between the ranks to be of equal value (18:25).

However, the weight given to a particular response such as "strong consideration" or "very strong consideration" may not have been judged on the same basis by different respondents. Additionally, some respondents may have been reluctant to select an extreme category such as "mandatory" or "never considered." To overcome the foregoing anomalies and reduce any response error caused by different verbal interpretations, the mean responses to survey questions utilizing the seven-point Likert scale were combined during data analysis, as outlined in Table 3, to form qualified support categories (19:25).

Table 3

Qualified Support Categorization (11:328)

Mean-Likert Response Categories	Qualified Support Categories
5.51 - 7.00	Full Support
4.01 - 5.50	General Support
2.51 - 4.00	Partial Support
1.00 - 2.50	No Support

Statistical Techniques

The statistical techniques used to analyze the data from the field survey are outlined in Figure 5 and discussed in subsequent sections.

Descriptive Statistics. Descriptive statistics were used to analyze Section I (Demographics) and Section II

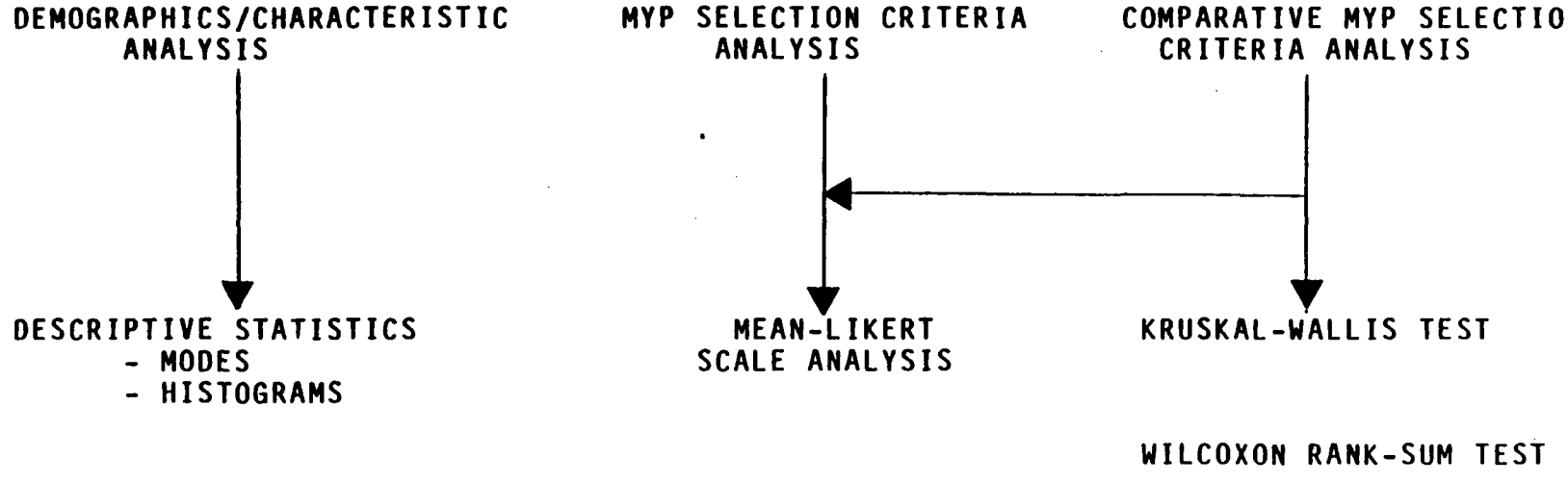


Figure 5

Statistical Analysis Plan

(MYP Selection Criteria Description) of the field survey instrument. The descriptive analysis of the data consisted of finding the mode for each survey question, which represented the most often selected response. The mode was chosen as the most valid measure of central tendency, because the responses to the questions in Sections I and II of the survey instrument were ordinal in nature (19:26). The relationships of the modes to the overall responses for the questions were then represented using histograms.

Mean-Likert Scale Analysis. The responses to the 23 MYP selection criteria in Sections II and III of the survey instrument were analyzed using the mean-Likert scale. The Likert scale responses to each MYP selection criterion were averaged to obtain an overall mean-Likert response for each MYP criterion. The mean-Likert scale response for each MYP selection criterion was then transformed into a qualified support category as described in the data transformation section of this chapter. The foregoing data analysis was repeated when the researchers performed comparative MYP selection criteria analysis for contractors having different demographic characteristics. Mean-Likert scale analysis was chosen to analyze the MYP selection criteria, because of the

ability of the mean-Likert scale to handle and categorize large amounts of data in an orderly manner (39).

Kruskal-Wallis Test. The Kruskal-Wallis test, a nonparametric statistical test, was used to determine if a significant difference existed among the rankings of MYP selection criteria by contractors having different demographic characteristics. The Kruskal-Wallis test was chosen for the comparative criteria analysis because of the test's ability to determine significant variations in sample distributions with unknown parameters (25:178). The Kruskal-Wallis test also provided the capability to compare any number of demographic characteristics in a single test to determine if significant differences existed for the MYP selection criteria (25:690). The Kruskal-Wallis test was used to compare the mean-Likert scale rankings of the 23 MYP selection criteria to determine if significant differences existed based on MYP experience, different product lines or production activities, or actual MYP use by the responding contractors.

The Kruskal-Wallis test was performed with a level of significance (alpha, α) equal to .05. The significance level was established at $\alpha = .05$, because $\alpha = .05$ provided a reasonable confidence level to support the

recommendations and conclusions without over restricting the nonparametric analysis.

Wilcoxon Rank-Sum Test. The Wilcoxon rank-sum test for independent samples was used to compare two independent samples to determine if the underlying probability distributions were significantly different (25:675). The Wilcoxon test was chosen because the test provided a means of evaluating the rank order of the 23 MYP selection criteria to determine if there was a significant difference in rankings by any two independent samples (20:178). The Wilcoxon test was used to compare the mean-Likert scale rankings of the 23 MYP selection criteria between the MYP experienced contractors[4] and the MYP inexperienced contractors. The Wilcoxon test was also used to further analyze the mean-Likert scale rankings of the 23 MYP selection criteria by the different product lines and production activities. Further analysis of the product line and production activity distributions would have been necessary if the Kruskal-Wallis test had indicated that at least one of the distributions associated with product line or production

---

[4] The definition of a MYP experienced contractor and all other key definitions are provided in Appendix A.

activity was different. Finally, the Wilcoxon rank-sum test was used to compare the MYP selection criteria actually used by MYP experienced contractors with the selection criteria the same contractors identified for future use.

The hypotheses, formulas, and decision rules for the Wilcoxon rank-sum test are identified in the chapter sections discussing the basic research methodology for each individual research question. The level of significance for the Wilcoxon rank-sum test was also established at $\alpha = .05$ for the same reasons identified earlier for the Kruskal-Wallis test.

Research Plan

The specific data analysis techniques and hypotheses for each research question related to the research objectives are discussed in this section. Table 4 relates the research objectives, research questions, survey instrument questions, and associated data analysis techniques. Each research objective and associated research questions (RQ) are repeated in the following sections for the convenience of the reader.

Research Objective 1. Determine the extent that MYP contracts are used in support of DOD programs.

To determine the degree that MYP contracts are being

Table 4

Relationships Among Research Objectives, Research Questions (RQ), Survey Instrument Questions, and Data Analysis Techniques

RESEARCH OBJECTIVES/QUESTIONS	SURVEY INSTRUMENT QUESTIONS/ SECTION	DATA ANALYSIS TECHNIQUE
Research Objective 1		
RQ 1	Question II-4	Descriptive Statistics
RQ 2	Question II-5	Descriptive Statistics
Research Objective 2		
RQ 3	Questions II-8, II-9, II-11, II-12, II-14, and II-15	Descriptive Statistics
RQ 4	Questions II-10, II-13, and II-16	Descriptive Statistics
Research Objective 3		
RQ 5	Question II-17	Mean-Likert Scale
RQ 6	Section III	Mean-Likert Scale
RQ 7	Question II-17 and Section III	Mean-Likert Scale Wilcoxon Rank-Sum
RQ 8	Questions II-1, II-2, II-3, and Section III	Mean-Likert Scale Wilcoxon Rank-Sum
RQ 9	Questions I-3, I-4, and Section III	Mean-Likert Scale Kruskal-Wallis Test Wilcoxon Rank-Sum

used for DOD programs, two research questions were formulated. The first research question dealt with the percentage of sales each contractor received through a MYP contract with the Government. The second research question dealt with the percentage of a contractor's subcontracted effort which utilized a MYP subcontract.

Research Question 1. What percentage of a contractor's sales dollars is obtained through MYP contracts?

Survey Question II-4 was used to determine the percentage of the contractor's sales dollars that were obtained through a MYP contract. Contractors were asked to respond to the question using one of six response categories, which described a percentage range of MYP sales dollars. The responses for each of the six categories were transformed into percentages. Histograms were used to visually represent the different response categories.

Research Question 2. What percentage of a contractor's subcontracted effort is provided through MYP subcontracts?

Survey Question II-5 was used to determine the percentage of a contractor's total subcontracted effort that was obtained through a MYP subcontract. Contractors responded to Survey Question II-5 by selecting one of

six response categories depicting a percentage range of subcontract effort using a MYP subcontract. The responses for each category were transformed into percentages. Histograms were then used to depict the relationships among the different response categories.

Research Objective 2. Determine the contract and subcontractor characteristics associated with the use of MYP at the subcontractor level.

To address Research Objective 2, two research questions were formulated. The MYP experienced contractors were asked to provide responses based on both actual MYP subcontracts and proposed MYP subcontracts. The number of responses addressing the proposed MYP subcontract characteristics was very small. Therefore, further analysis of the proposed MYP subcontract characteristics would have been meaningless.

Research Question 3. What are the characteristics of MYP contracts at the subcontractor level?

MYP experienced contractors were asked to respond to Survey Questions II-8, II-9, II-11, II-12, II-14, and II-15 to determine the MYP contract characteristics at the subcontractor level. The MYP contract characteristics analyzed were (1) type of contract, (2) competitive environment, (3) technical complexity, (4) production

lot, (5) length of subcontract, and (6) length of the program associated with the MYP subcontract.

The percentage responses for each actual category were averaged. The relationships among the responses for each survey question were represented using histograms.

Research Question 4. What are the characteristics of subcontractors who receive MYP subcontracts?

MYP experienced contractors responded to Survey Questions II-10, II-13, and II-16 to determine the characteristics of subcontractors who received MYP subcontracts. The MYP subcontractor characteristics analyzed were (1) sales dollars, (2) the industry associated with the subcontracted effort, and (3) the average industry experience of the MYP subcontractor.

The percentage responses for each of the actual categories were averaged. The relationships among the responses for each survey question were represented using histograms.

Research Objective 3. Determine the selection criteria that contractors consider important when contemplating the placement of MYP subcontracts to lower-tier subcontractors.

Five research questions were formulated to accomplish the above research objective. Research Questions 5, 6, 7, 8, and 9 were analyzed to determine the actual and future MYP selection criteria and to determine if the criteria would vary as a result of MYP experience, different product lines, or different production activities.

Research Question 5. What are the selection criteria that contractors actually used when contemplating the placement of MYP subcontracts to lower-tier subcontractors?

Question II-17 of the field survey instrument asked contractors to rate 23 MYP selection criteria on a seven-point Likert scale to express the degree that each criterion was considered when evaluating the use of MYP for subcontracts. A mean-Likert scale analysis was used to determine the degree of consideration given to each MYP selection criterion. The responses to each of the 23 MYP selection criteria were averaged to obtain a mean-Likert response for each criterion. The mean-Likert responses were then ranked from highest to lowest (where 7=highest response and 1=lowest response feasible) to determine the order of importance for the 23 MYP selection criteria. Finally, the mean-Likert responses were utilized to form the previously described qualified

support categories. The qualified support categories identified whether the respondents indicated full support, general support, partial support, or no support for using each criterion in the decision to use MYP with a subcontractor.

Research Question 6. What are the selection criteria that contractors consider important when contemplating the use of MYP for future subcontracts to lower-tier subcontractors?

Section III of the survey instrument was used to acquire the data for the analysis of future MYP selection criteria. A mean-Likert scale analysis was performed on the 23 MYP selection criteria using the same procedures outlined for Research Question 5. The results from evaluating Research Question 6 were identified as a mean-Likert scale ranking for the 23 MYP selection criteria and the corresponding assignment of a qualified support category for each criterion.

Research Question 7. Is there a significant difference in the ranking of the 23 MYP selection criteria actually used by contractors and the ranking of the 23 MYP selection criteria the same contractors identified for future use?

The results of the mean-Likert scale analysis for Research Question 5 and the portion of Research Question

6 related to MYP experienced contractors were compared to determine if a significant difference existed in the ranking of the 23 MYP selection criteria actually used by contractors and the ranking of the 23 MYP selection criteria the same contractors identified for future use.

A comparative analysis of the ranked MYP selection criteria using the mean-Likert responses from Research Questions 5 and 6 was accomplished to determine if there were any significant differences between the rankings. Since tne data obtained from the mean-Likert responses for the criteria could be ranked in order of magnitude, the Wilcoxon rank-sum test was used to test the null hypothesis (H_0) that the rankings for the 23 MYP selection criteria actually used by contractors would not be significantly different from the rankings identified by the same contractors for future MYP subcontractor selection (25:677). The following procedures were used to conduct the Wilcoxon test (25:675-678):

1. The null and alternate hypotheses were established as follows:

H_0 = The probability distributions for the MYP selection criteria actually used and the MYP selection criteria proposed for future use by the same contractors were identical; therefore, the mean-Likert scale rankings of MYP selection criteria actually used in the past and the MYP selection criteria proposed for future use were not significantly different.

H_a = The probability distributions for the MYP selection criteria actually used and the MYP selection criteria proposed for future use by the same contractors were not identical; therefore, the mean-Likert scale rankings of MYP selection criteria actually used in the past and the MYP selection criteria proposed for future use were significantly different.

2. The level of significance (alpha, α) for the Wilcoxon test was set at α=.05 as discussed previously.

3. The mean-Likert scale responses for the two probability distributions were ranked from highest to lowest as though they were all drawn from the same population. The combined ranks were then placed in a two dimensional matrix consisting of two columns (one column for the actual MYP selection criteria ranks and one column for the future MYP selection criteria ranks) and n rows (one for each of the 23 criteria).

4. The sum of the ranks was computed for each of the columns (T_{actual} and T_{future}).

5. The test statistic (T) for the Wilcoxon rank-sum test is the sum of the ranks for the sample with fewer measurements. Since the number of MYP selection criteria for each sample was the same, either rank-sum could have been evaluated (25:677).

$$T = T_{actual} \text{ or } T_{future}$$

6. The critical value (U) for the .05 level of significance was determined from the Wilcoxon rank-sum table (27:53).

7. The test statistic, T, was compared to the critical values obtained in Step 6. If T had been greater than U, the conclusion would have been to reject H_0 and accept the alternate hypothesis, H_a.

Research Question 8. Is there a significant difference in the rankings for the 23 MYP selection criteria proposed for future use by MYP experienced and MYP inexperienced contractors?

Experienced MYP contractors were previously defined as those contractors who have (1) participated in a MYP contract, (2) participated in the development of a MYP cost or technical proposal, or (3) subcontracted to a lower-tier subcontractor using a MYP subcontract.

Three survey questions (II-1, II-2, and II-3) were analyzed to determine if the responding contractors were experienced in the use of MYP. If the respondent possessed any of the above characteristics, the firm was considered to be a MYP experienced contractor.

Survey Questions II-1, II-2, and II-3 and Section III of the survey instrument were used to determine if MYP experienced contractors would use different selection criteria from MYP inexperienced contractors when

considering the use of MYP with lower-tier subcontractors. A mean-Likert scale analysis was performed on the two responding contractor groups: (1) MYP experienced and (2) MYP inexperienced. The Likert scale responses for each criterion were averaged separately for each responding contractor group, and then the criteria were ranked from the highest mean-Likert response (for criterion number 1) to the lowest mean-Likert response (for criterion number 23).

A comparative analysis was accomplished using the same procedures outlined for the Wilcoxon rank-sum test outlined in the analysis for Research Question 7. The following procedures were used to conduct the Wilcoxon rank-sum test (25:675-678):

1. The null and alternate hypotheses were established as follows:

H_0 = The probability distributions for the MYP experienced and MYP inexperienced contractors were identical; therefore, the mean-Likert rankings of MYP selection criteria for MYP experienced and MYP inexperienced contractors were not significantly different.

H_a = The probability distributions for the MYP experienced contractors and MYP inexperienced contractors were not identical; therefore, the mean-Likert rankings of MYP selection criteria for MYP experienced and MYP inexperienced contractors were significantly different.

2. The level of significance (alpha, α) for the Wilcoxon test was set at α=.05 as discussed previously.

3. The mean-Likert scale responses for the two probability distributions were ranked from highest to lowest as though they were all drawn from the same population. The combined ranks were then placed in a two dimensional matrix consisting of two columns (one column for MYP experienced contractor ranks and one column for MYP inexperienced contractor ranks) and n rows (one for each of the 23 MYP selection criteria).

4. The sum of the ranks was computed for each of the columns ($T_{experienced}$ and $T_{inexperienced}$).

5. The test statistic (T) for the Wilcoxon rank-sum test is the sum of the ranks for the sample with fewer measurements. Since the number of MYP selection criteria for each sample was the same, either rank-sum could have been evaluated (25:677).

$$T = T_{experienced} \text{ or } T_{inexperienced}$$

6. The critical value (U) for the .05 level of significance was determined from the Wilcoxon rank-sum table (27:53).

7. The test statistic, T, was compared to the critical value obtained in Step 6. If T had been greater

than U, the conclusion would have been to reject H_0 and accept the alternate hypothesis, H_a.

Research Question 9. Is there a significant difference in the rankings for the 23 MYP selection criteria among contractors having different product lines or production activities?

To evaluate the effects that different demographic characteristics had on the proposed MYP selection criteria, Survey Questions I-3 and I-4 and Section III were analyzed. A mean-Likert scale analysis was performed on the 23 MYP selection criteria for the four most significant product line response categories --(1) Aircraft/ Helicopters, (2) Missiles, (3) Avionics, and (4) Power Plant/Engines-- and the three most significant production activity response categories --(1) Fabrication, (2) Final Assembly and Integration, and (3) Other. The same mean-Likert scale approach used for Research Question 5 was also used to analyze the rankings of the MYP selection criteria by contractors responding to the different product line and production activity response categories.

The comparative analysis of the mean-Likert scale response categories for the different product lines and production activities was accomplished using the Kruskal-Wallis one-way analysis of variance test. The Kruskal-Wallis one-way analysis of varia : test was used to

determine if the ranked mean-Likert scale responses for the 23 MYP selection criteria were significantly different for both the product line categories and production activity categories. The Kruskal-Wallis test was used to evaluate the null hypotheses (H_0) that the rankings of the 23 MYP selection criteria by the different product lines or by the different production activities were not significantly different. The following procedures were used to conduct the Kruskal-Wallis test (25:690):

1. The null and alternate hypotheses were established as follows:

a. For the product lines:

H_0 = The probability distributions for the four most significant product line response categories were identical; therefore, the mean-Likert scale rankings of MYP selection criteria for the four product lines were not significantly different.

H_a = At least one of the probability distributions for the four most significant product line response categories was not identical to the other probability distributions; therefore, the mean-Likert scale rankings of MYP selection criteria used by the contractors in at least one of the four product lines was significantly differen..

b. For the production activities:

H_0 = The probability distributions for the three most significant production activity categories were identical; therefore, the mean-Likert scale rankings of

the MYP selection criteria for the three production activities were not significantly different.

H_a = At least one of the probability distributions for the three most significant production activity categories was not identical to the other probability distributions; therefore, the MYP selection criteria used by the contractors in at least one of the three production activities were significantly different.

2. The level of significance (alpha, α) for the Kruskal-Wallis test was $\alpha = .05$.

3. The mean-Likert scale responses for each of the probability distributions were ranked from highest to lowest as though they were all drawn from the same population. The combined ranks were then placed in separate two dimensional matrices having k columns and n rows. For the analysis of the product lines, four columns for (1) Aircraft/Helicopters, (2) Missiles, (3) Avionics, and (4) Power Plant/Engines, and 23 rows (one for each of the 23 MYP selection criteria) were used. For the analysis of the production activities, three columns for (1) Fabrication, (2) Final Assembly and Integration, and (3) Other, and 23 rows (one for each of the 23 MYP selection criteria) were utilized.

4. The rank-sums were determined for each column (R_j) for both the product line and production activity matrices.

5. The value of the test statistic, H, was computed in the following manner:

$$H = \frac{12}{n(n+1)} \sum_{j=1}^{k} \frac{R_j^2}{n_j} - 3(n+1)$$

where:

n_j = Number of measurements in sample j.

R_j = Rank-sum for sample j, where the rank of each measurement is computed according to its relative magnitude in the totality of data for the k samples.

n = Total sample size = $n_1 + n_2 + ..+ n_k$.

k = Number of probability distributions being compared.

6. The critical value for the .05 level of significance was determined from the chi-square distribution table using k-1 degrees of freedom (27:42).

7. The calculated H values for the product lines and production activities were compared against the critical values obtained in Step 6. If the calculated H value had exceeded the critical value, the conclusion would have been to reject H_0. If the null hypothesis (H_0) had been rejected, it would have indicated that at least one of the population distributions was significantly different.

If the Kruskal-Wallis test had indicated a significant difference in the probability distributions within

the response categories for product lines or production activities, the Wilcoxon rank-sum test would have been used to further analyze the response categories. Each response category for the characteristic indicating a difference in probability distributions would have been analyzed against every other response category. The Wilcoxon test would have been used to evaluate the null hypothesis that the rankings of the 23 MYP selection criteria by any two of the response categories would not be significantly different. The data analysis procedures outlined for Research Question 7 using the Wilcoxon test would have been used.

Summary List of Assumptions

1. The benefits associated with the use of MYP at the prime contractor level should also be realized at the subcontractor level.

2. Any variables omitted in data collection and analysis had no significant impact on the research results.

3. All responses supplied by the data sources reflect the real world situation.

4. Survey respondents interpreted the survey questions in the same manner.

5. All sample categories for the research project were random and independent.

Summary List of Limitations

1. The responses to the survey instrument were based on the attitudes and opinions of key contractor personnel. Since the increased use of MYP is a new acquisition strategy, most contractor responses are based on what the contractor's anticipated MYP selection criteria would be, rather than on actual experience.

2. Response accuracy was dependent on the time that surveyed contractor personnel spent completing the survey instrument.

3. Some aspects of data collection and analysis were limited by the researchers' experience.

Summary

The details of the research methodology used to accomplish the research project were outlined in this chapter.

The population of interest for the research effort consisted of all defense contractors within the defense industrial base which produce goods and services ultimately used in Air Force weapon systems. Five functional areas of 110 defense contractors were asked to respond to a field survey.

The analysis of the data obtained from the field survey consisted of using mean-Likert scale analysis to obtain a mean response for each of the 23 MYP selection criteria. The mean responses were then ranked from highest to lowest to provide a prioritized listing of MYP selection criteria that contractors considered important when contemplating the placement of MYP subcontracts to lower-tier subcontractors. The ranked mean responses were transformed into qualified support categories which classified the degree of criterion support as full support, general support, partial support, or no support.

The mean-Likert scale rankings of MYP selection criteria from different groups or categories were compared to each other to determine if a significant difference existed in the rankings of the MYP selection criteria. The following comparative analyses were accomplished:

1. The ranked MYP selection criteria from MYP experienced contractors were compared to the ranked MYP selection criteria from MYP inexperienced contractors.

2. The mean-Likert scale ranking of the MYP selection criteria that contractors actually used to evaluate potential MYP subcontractors was compared to the mean-Likert scale ranking of the MYP selection

criteria the same contractors identified for future MYP subcontractor consideration.

3. The mean-Likert scale rankings of the MYP selection criteria for four product lines were compared to determine if the overall rankings of MYP selection criteria were different.

4. The mean-Likert scale rankings of the MYP selection criteria for three production activities were compared to determine if the rankings of MYP selection criteria were different.

Finally, the different characteristics associated with MYP contracts and subcontractors were analyzed to identify the characteristics normally associated with the use of MYP at the subcontractor level.

CHAPTER IV

DATA ANALYSIS AND FINDINGS

Introduction

Chapter III described the overall research methodology used to accomplish the three research objectives identified in Chapter I. Chapter IV presents the results of the data collection and data analysis used to evaluate each research question developed to accomplish the stated research objectives. The findings culminating from the data analysis will be used to draw conclusions and make recommendations about the use of multiyear procurement (MYP). The following sections will provide a brief discussion of the sample selection results, demographics analysis, primary findings, and corollary findings. The research findings from the evaluation of the nine research questions as related to the three research objectives are discussed as primary findings. The additional comments provided by contractors in the field survey instrument and the researchers' interpretation of observations are discussed as corollary findings.

Sample Selection Results

As mentioned in Chapter III, surveys were sent to 110 defense contractors. Two surveys were sent to each of the following functional areas: (1) Manufacturing/ Operations Management; (2) Financial Management; (3) Contract Management; (4) Subcontract Management/Materials Management; and (5) Marketing. Two survey instruments were mailed to each functional area in an attempt to increase the response rate. When two responses were returned from the same functional area of a firm, the most complete survey instrument was selected for analysis. A total of 550 surveys were distributed to firms within the defense industry.

A total of 134 survey instruments were returned from 65 different contractors. The 134 responses were compared to determine if duplicate responses had been received from the same functional area within any contractor. Twenty-four duplicate responses were discovered, and, in the case of duplicates, the most complete survey instrument was selected for analysis. Of the 110 defense contractors that received survey instruments, 59 percent of the contractors returned completed surveys (i.e., 65 defense contractors). But, the overall survey response rate was only 24 percent (i.e., 134 completed

surveys ÷ 550 total surveys transmitted = 24 percent response rate).

The researchers identified several reasons for the relatively low response rate. First, many of the respondents were not given sufficient time to complete the surveys prior to the established response date. Although the respondents were allowed more than six weeks to complete the survey by the researchers, the time limit was insufficient to account for the corporate reviews conducted by many of the responding firms. In several cases, the response deadline had already occurred before the respondent had received the survey instrument.

Secondly, some survey instrument questions requested information that required considerable research effort on the part of the respondent. Although the response rate was lower than anticipated, most responding contractors took the necessary time to research the subject matter and provided completed survey instruments.

Finally, some of the information requested in the survey instrument dealt with cost-related issues considered sensitive by some contractors. Although each contractor was assured that the information provided by the firm would be handled in complete confidence, many

contractors did not release the cost-related information.

A complete list of the contractors responding to the survey instrument is provided in Appendix D. To insure that the firms would be encouraged to provide accurate and complete responses to the survey questions, anonymity for individual firm's responses was guaranteed as part of the survey procedure. Hence, the researchers did not attempt to isolate any one firm's responses.

Demographics Analysis

Section I of the survey instrument requested demographic information pertaining to the company as well as to the individual respondent within each firm. The demographic information provided some face validity for the responses and enabled the researchers to further analyze the MYP selection criteria outlined in Sections II and III of the survey instrument. A brief discussion of the demographics associated with the research sample is provided in the following section. A complete summary of the demographics, including histograms which show the relationships among the response categories for each demographic related survey question, is found in Appendix E.

Responding Firms

Of the responses from the research sample, 46.4 percent were received from the electronics/avionics industry. Of the remaining five industry categories, no one category accounted for over 15 percent of the survey responses. Over 97 percent of the responding firms indicated that the firm's primary production activities were fabrication, final assembly and integration, and "other." Most respondents that selected the "other" category indicated that they were prime contractors and performed all three production activities -- fabrication, integration, and final assembly. Only 2.7 percent of the responding firms were involved in the subassembly production activity. Four product line categories provided over 63 percent of the survey responses. The four product line categories and corresponding percentages were: (1) Aircraft/Helicopters (22.7%), (2) Missiles (15.5%), (3) Avionics (13.6%), and (4) Power Plant/ Engines (11.8%).

Respondents' Characteristics

An analysis of the individuals within the firms responding to the survey indicated that 97.4 percent of the respondents held executive management or middle

management positions and that 47 percent of the respondents held the management positions for more than five years. The responses indicated that 88.2 percent of the survey respondents have been employed within the defense industry for over 15 years.

Summary of Demographics

The primary purpose of the demographics section (Section I) of the survey instrument was to gain information about the respondents and the respondents' firms to provide credibility and validity to the survey analysis. Additionally, portions of Section I were used in the analysis of data obtained from Sections II and III of the survey instrument. The results of the data analysis of Sections II and III are discussed in subsequent sections of this chapter.

Even though 65 of the 110 defense contractors responded to the survey, the 24 percent survey response rate based on the five management areas within the 110 defense contractors was considered low. However, the management and experience levels of the individual respondents provided increased confidence in the validity of the survey findings. Since a majority of the respondents were from middle or executive management positions, with over 15 years of experience within the

defense industry, the survey respondents were considered to be very knowledgeable of DOD contracting practices.

Primary Findings

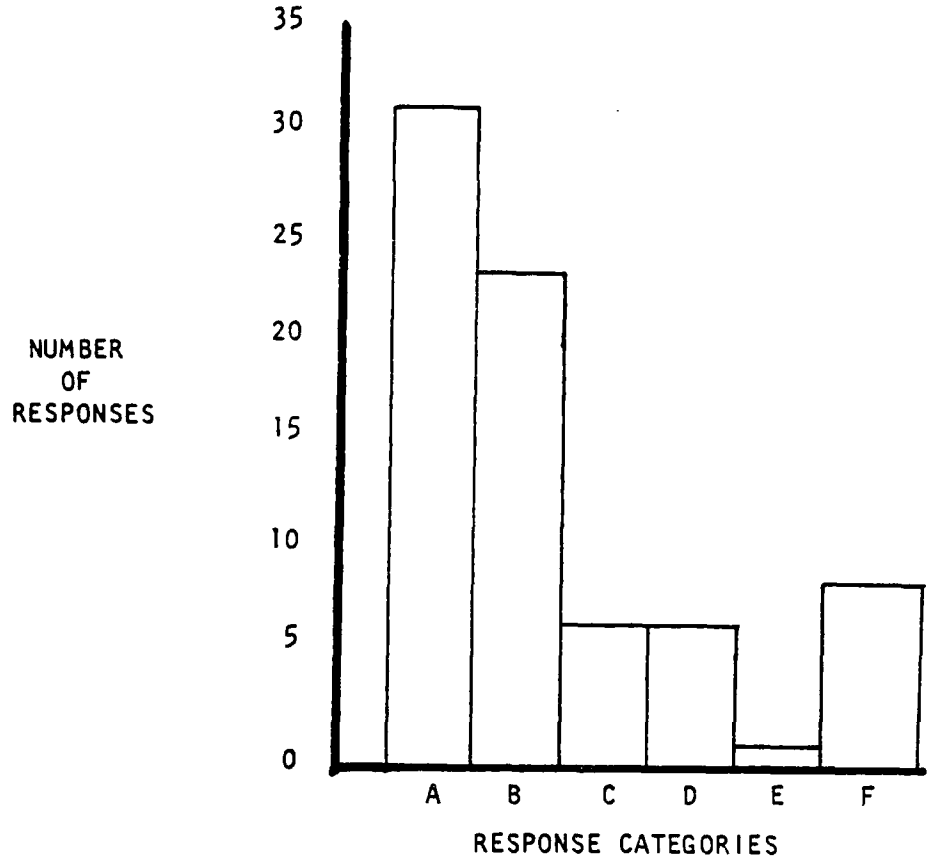
The results of the survey data analysis and statistical tests for the nine research questions are reported in this section. The research objectives and the corresponding research questions used to accomplish each research objective are restated prior to the discussion of the research findings.

Research Objective 1

Determine the extent that MYP contracts are used in support of DOD programs.

Research Question 1. What percentage of contractors' sales dollars is obtained through MYP contracts?

As depicted in Figure 6, 41.3 percent of the respondents have less than one percent of sales dollars coming from MYP contracts. Further investigation reveals that 72 percent of the respondents have less than 10 percent of sales dollars originating from MYP contracts. The analysis indicates that the use of MYP throughout the defense industrial base is not widespread.



RESPONSE CATEGORY	PERCENTAGE OF SALES DOLLARS	NUMBER OF RESPONSES	PERCENTAGE OF TOTAL
A	$<$ 1%	31	41.3%
B	$\geq$ 1%, BUT $<$ 10%	23	30.7%
C	$\geq$ 10%, BUT $<$ 20%	6	8.0%
D	$\geq$ 20%, BUT $<$ 30%	6	8.0%
E	$\geq$ 30%, BUT $<$ 40%	1	1.3%
F	$\geq$ 40%	8	10.7%

$<$ = Less Than
$\geq$ = Greater Than or Equal to

Figure 6

Percentage of Sales Dollars Using MYP

Research Question 2. What percentage of contractors' subcontracted efforts to lower-tier subcontractors is provided through MYP?

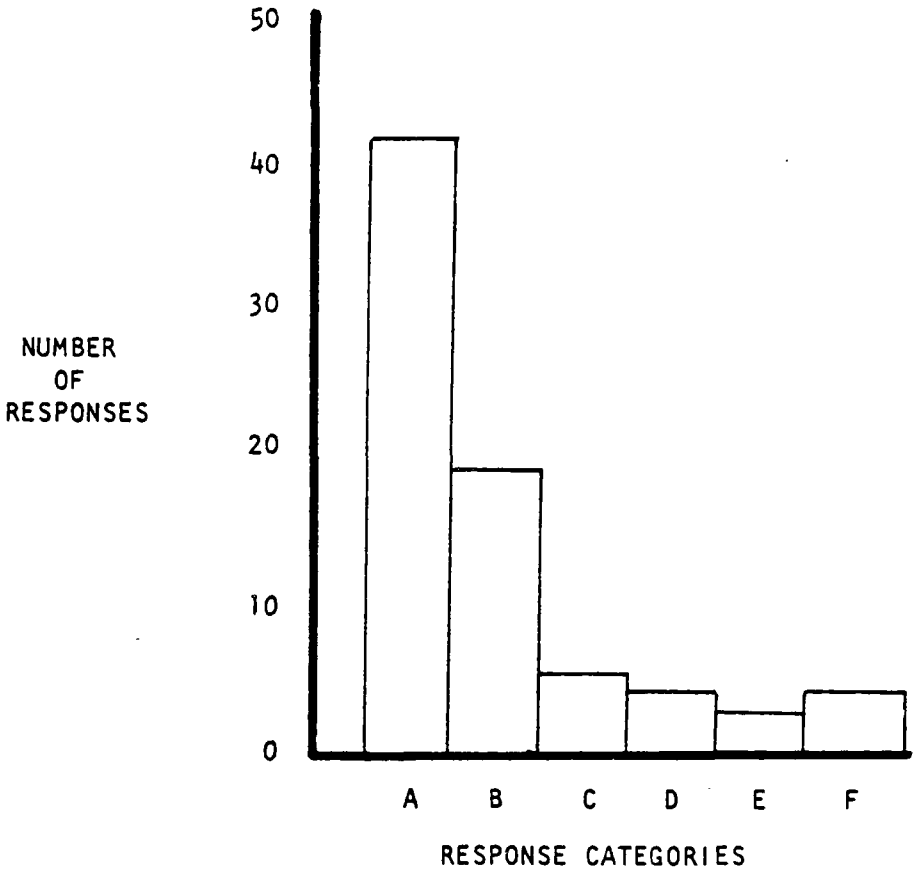
An analysis of the amount of subcontracted effort being contracted for using MYP indicated that more than 56 percent of the respondents are using MYP contracts for less than one percent of subcontracted business. Further analysis identified that less than 18 percent of the respondents are using MYP for more than 10 percent of subcontracted business. The percentage distributions for actual MYP contract use for subcontract effort are depicted in Figure 7.

Research Objective 2

De' mine the contract and subcontractor characteristics associated with the use of MYP at the subcontractor level.

Research Question 3. What are the characteristics of MYP contracts at the subcontractor level?

Table 5 summarizes the characteristics of MYP contracts at the subcontractor level. As Table 5 indicates, firm fixed price (FFP) contracts are used for over 89 percent of MYP subcontracted efforts to lower-tier subcontractors. Other significant subcontract characteristics include: (1) competitive or follow-on



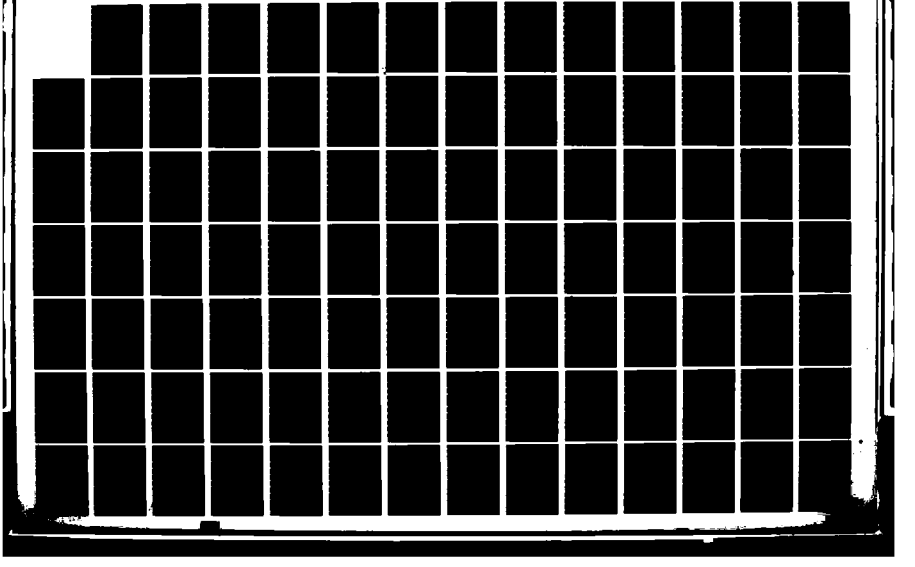
RESPONSE CATEGORY	PERCENTAGE OF SUBCONTRACTED EFFORT	NUMBER OF RESPONSES	PERCENTAGE OF TOTAL
A	$\leq$ 1%	42	56.8%
B	$\geq$ 1%, BUT $<$ 10%	19	25.7%
C	$\geq$ 10%, BUT $<$ 20%	5	6.8%
D	$\geq$ 20%, BUT $<$ 30%	3	4.0%
E	$\geq$ 30%, BUT $<$ 40%	2	2.7%
F	$\geq$ 40%	3	4.0%

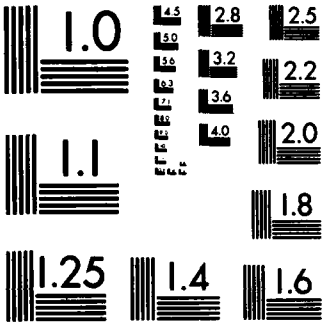
$<$ = Less Than
$\geq$ = Greater Than or Equal to

Figure 7

Percentage of Subcontracted Effort Provided Using MYP

AD-A135 638 MULTIYEAR SUBCONTRACTOR SELECTION CRITERIA ANALYSIS(U) 2/3
AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH SCHOOL
OF SYSTEMS AND LOGISTICS D L GRAY ET AL. SEP 83
UNCLASSIFIED AFIT-LSSR-106-83 F/G 5/1 NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

Table 5

MYP Subcontract Characteristics

TYPE OF CONTRACT	PERCENTAGE
Firm Fixed Price	89.1
Other Fixed Price	5.4
Cost Plus Fixed Fee	4.7
Cost Plus Incentive	.6
Fixed Price Incentive	.1
Other Cost Type	.1
Cost	0
	100.0

SIZE OF SUBCONTRACT ($ MILLION)	PERCENTAGE
≤ $10	76.6
≥ $10, But ≤ $30	9.3
≥ $30, But ≤ $50	10.0
≥ $50, But ≤ $70	4.0
≥ $70, But ≤ $90	.0
≥ $90, But ≤ $110	.1
≥ $110	.0
	100.0

DOD MARKETPLACE	PERCENTAGE
Competitive	32.9
Follow-On	47.3
Sole Source	19.8
	100.0

LENGTH OF SUBCONTRACT PERIOD	PERCENTAGE
≤ 1 Year	.2
≥ 1, But ≤ 3 Years	77.7
≥ 3, But ≤ 5 Years	10.5
≥ 5 Years	11.6
	100.0

STATUS OF HARDWARE DESIGN	PERCENTAGE
100% Designed	85.0
80% Designed	6.8
60% Designed	4.3
40% Designed	.4
20% Designed	3.5
	100.0

PRODUCTION LOT	PERCENTAGE
First	21.4
Second	19.6
Third or Subsequent	59.0
	100.0

procurements occurred in over 80 percent of MYP subcontracts, (2) the hardware design was complete in 85 percent of MYP subcontracts, (3) the subcontract was for less than $10 million in more than 76 percent of the MYP subcontracts, (4) the length of the subcontract was between one and three years in more than 77 percent of MYP subcontracts, and (5) MYP subcontracts were used for the third or subsequent production lots in 59 percent of the multiyear procurements.

The analysis of the above MYP subcontract characteristics indicated that the most common MYP subcontract was a FFP contract for less than $10 million to be completed in less than three years. Furthermore, the most common MYP subcontract was placed in a competitive or follow-on environment with the hardware completely designed in a third or subsequent production lot.

Research Question 4. What are the characteristics of subcontractors who receive MYP subcontracts?

The characteristics of subcontractors who received MYP subcontracts are outlined in Table 6. Over half of the respondents (52.9 percent) reported that MYP subcontractors have average annual sales of less than $10 million. However, responses were reported for all annual sales categories, including 10.7 percent of the

Table 6

MYP Subcontractor Characteristics

SIZE OF MYP SUBCONTRACTOR (Annual Sales in Million $)	PERCENTAGE
< $10	52.9
≥ $10, But < $30	12.4
≥ $30, But < $50	3.6
≥ $50, But < $70	14.0
≥ $70, But < $90	4.0
≥ $90, But < $110	2.4
≥ $110	10.7
	100.0

MYP SUBCONTRACTOR INDUSTRY	PERCENTAGE
Electronics/Avionics	41.6
Power Plant/Engines	14.6
Structural Subassemblies	10.3
Raw Materials	6.1
Landing Gears	5.9
Support Systems	1.0
Radar/Guidance Systems	.7
Other*	19.8
- Ordnance/Explosives	
- Software	
- Machined Parts	
- Propellants	
	100.0

MYP SUBCONTRACTOR EXPERIENCE	PERCENTAGE
< 1 Year	.4
≥ 1, But < 5 Years	12.7
≥ 5, But < 10 Years	8.8
≥ 10, But < 15 Years	22.3
≥ 15, But < 20 Years	13.8
≥ 20, But < 25 Years	10.3
≥ 25 Years	31.7
	100.0

* Respondent Identified Industries

< = Less Than
≥ = Greater Than or Equal to

MYP subcontractors having greater than $110 million in annual sales.

Of the MYP subcontracts, 41.6 percent occurred in the electronics/avionics industry. The high usage of MYP subcontracts within the electronics/avionics industry was not unusual considering the large number of survey responses received from the electronics/avionics industry (46.6 percent).

Finally, the experience level of the MYP subcontractor was analyzed. The results of the analysis indicated a fairly uniform response rate in all categories between one year and 25 years. Very few (.4 percent) of the MYP subcontractors had less then one year of experience. Survey responses indicated that 78.1 percent of the MYP subcontractors have over 10 years of experience with over 31 percent of the subcontractors with more than 25 years experience.

In general, the MYP subcontractors are characterized as small businesses (annual sales under $30 million) and highly experienced firms representing many different industries within the defense industrial base.

Research Objective 3

Determine the selection criteria that contractors consider important when contemplating the placement of MYP subcontracts to lower-tier subcontractors.

Research Question 5. What are the selection criteria that contractors actually used when contemplating the placement of MYP subcontracts to lower-tier subcontractors?

Based on the research methodology outlined in Chapter III, the mean-Likert responses of the 23 MYP selection criteria in Section II of the survey were ranked from highest to lowest and categorized into qualified support categories. Table 7 summarizes the results of the mean-Likert scale analysis and identifies the MYP selection criteria actually used by MYP experienced contractors when considering the use of a MYP subcontract with lower-tier subcontractors. The mean-Likert scale ranking of the criteria are listed in descending order of importance based on the mean-Likert response for each criterion.

Five MYP selection criteria were categorized as providing "full support" (mean-Likert response between 5.51 and 7.00) for the actual decision to use MYP with subcontractors. The availability of multiyear funding was identified as the criterion considered most important to defense contractors when making a decision to use MYP with subcontractors.

In addition to rating the 23 MYP selection criteria, respondents were given space on the survey

Table 7

MYP Subcontractor Selection Criteria Actually Used
by MYP Experienced Contractors

OVERALL MYP CRITERIA	MEAN-LIKERT RESPONSE	QUALIFIED SUPPORT CATEGORY
Availability of Multiyear Funding	6.14	FULL SUPPORT
Degree of Configuration Stability	5.72	
Degree of Funding Stability	5.66	
Amount of Cost Savings Expected	5.54	
Subcontractor's Production Capacity	5.52	
Amount of Termination Liability Your Firm Must Assume	5.44	GENERAL SUPPORT
Experience Level of Subcontractor	5.34	
Production Quantities are Stable	5.32	
Must be in Support of an Ongoing MYP Contract	5.25	
Past Performance of Subcontractor	5.25	
Economic Order Quantity Application	5.12	
Advance Government Funding	4.90	
Shelf Life of Subcontracted Item	4.88	
Funding Needs of the Subcontractor	4.78	
Complexity of Technology	4.54	
Dollar Size of Subcontract Effort	4.44	
Length of Subcontract Effort	4.42	
Capital Investment Commitments by Subcontractors	4.40	
Potential for Advance Buys	4.33	
Industry Product Line of Subcontract Effort	4.30	
Your Firm's Storage Capacity	4.22	
Number of Potential Competitors	4.20	
The Number of Shipsets per Production Lot	4.08	

instrument to provide other criteria that were actually considered when evaluating the use of MYP for subcontracts. Table 8 outlines additional criteria identified by responding contractors as important but not included as one of the 23 MYP selection criteria. The Likert scale response provided by the contractors is also identified for each additional criterion.

Research Question 6. What are the selection criteria that contractors consider important when contemplating the use of MYP for future subcontracts to lower-tier subcontractors?

Based on the research methodology outlined in Chapter III, the mean-Likert scale responses for the 23 MYP selection criteria in Section III of the survey instrument were ranked from highest to lowest and categorized into qualified support categories. Table 9 summarizes the results of the mean-Likert scale analysis and identifies the ranking of the MYP selection criteria considered important by all responding contractors when contemplating the use of MYP for future subcontracts to lower-tier subcontractors. The mean-Likert scale ranking of the MYP selection criteria is provided in descending order of importance.

Six MYP selection criteria were categorized as providing "full support" (mean-Likert response between 5.51

Table 8

Contractor Identified MYP Subcontractor
Selection Criteria Actually Used
by MYP Experienced Contractors

CONTRACTOR IDENTIFIED CRITERIA	LIKERT RESPONSE	
Comparison to Price History	*	
Financial Condition of Subcontractor	*	
Quality Performance of Subcontractor	*	
Progress Payments	6	Very Strong Consideration
Status of Economy	6	
Annual MYP Usage	6	
Lead-Time	6	
Unique Technical Ability	6	

* Rating not Given

Table 9

MYP Subcontractor Selection Criteria for Future Use by All Responding Firms

FUTURE MYP CRITERIA	MEAN-LIKERT RESPONSE	QUALIFIED SUPPORT CATEGORY
Availability of Multiyear Funding	6.34	Full Support
Amount of Cost Savings Expected	5.97	
Degree of Funding Stability	5.93	
Degree of Configuration Stability	5.84	
Amount of Termination Liability Your Firm Must Assume	5.72	
Advance Government Funding	5.54	
Production Quantities are Stable	5.49	General Support
Must be in Support of an Ongoing MYP Contract	5.47	
Economic Order Quantity Application	5.46	
Subcontractor's Production Capacity	5.46	
Past Performance of Subcontractor	5.21	
Shelf Life of Subcontracted Item	5.18	
Experience Level of Subcontractor	5.13	
Funding Needs of Subcontractor	4.98	
Dollar Size of Subcontract Effort	4.94	
Complexity of Technology	4.89	
Length of Subcontract Effort	4.83	
Capital Investment Commitments by Subcontractors	4.82	
Potential for Advance Buys	4.72	
Number of Potential Competitors	4.60	
Your Firm's Storage Capacity	4.26	
Industry Product Line of Subcontract Effort	4.18	
The Number of Shipsets per Production Lot	4.11	

and 7.00) in the MYP subcontractor selection decision. Again, the availability of multiyear funding was identified as the criterion considered most important to defense contractors when contemplating the use of MYP subcontracts.

In addition to rating the 23 MYP selection criteria, respondents were given additional space on the survey instrument to provide other criteria that should be considered when evaluating the use of MYP for subcontracts. Table 10 outlines the additional criteria identified by all responding firms as important but not included as one of the 23 MYP selection criteria. The Likert scale response provided by the contractors is also identified for each additional criterion.

Research Question 7. Is there a significant difference in the ranking of the 23 MYP selection criteria actually used by contractors and the ranking of the 23 MYP selection criteria the same contractors identified for future use?

Based on the research methodology outlined in Chapter III, two statistical tests were performed to determine if a significant difference existed in the ranking of the 23 MYP selection criteria actually used by MYP experienced contractors and the ranking of the 23 MYP selection criteria the same contractors identified

Table 10

Contractor Identified MYP Subcontractor
Selection Criteria for Future Use
by All Responding Firms

CONTRACTOR IDENTIFIED CRITERIA	LIKERT RESPONSE	
General Economic Climate	*	
Political Climate	*	
Critical Material Availability	7	→ Mandatory Consideration
Business Base Adjustment	7	
Internal Make-or-Buy Long Range Plans	7	
Interest Rates and Cost of Borrowing	7	
DAR Policies Concerning Advance Buys	7	
Percent of MYP Annual Sales Versus Total Sales	7	
Relationship Between Funding Stability and Termination Coverage	7	
Stability of Prime Contractor	6	→ Very Strong Consideration
Government Commitment to Program	6	
Efficiencies of Production	6	
Critical Skills Requirements	6	
Annual MYP Usage	6	
Lead-Time	6	
Unique Technical Ability	6	
Storage and Handling Costs	6	
Progress Payment Percentage	6	
Annual Escalation Rate	6	
Add-On/Mobilization Potential	5	→ Strong Consideration
Freight and Transportation Cost	4	→ Considered

* Rating Not Given

for future use. First, the mean-Likert analysis of the 23 MYP selection criteria was performed on a portion of Section III of the survey instrument and visually compared to the mean-Likert analysis performed for Research Question 5. The Wilcoxon rank-sum test was then used to determine if a difference existed in the ranking of the 23 MYP selection criteria actually used by contractors and the mean-Likert ranking of the 23 MYP selection criteria the same contractors identified for future use.

Mean-Likert Scale Analysis. The Likert scale responses to the 23 MYP selection criteria in Section III of the survey instrument by contractors responding to Survey Question II-17 were averaged to form individual mean-Likert responses for each criterion. The mean-Likert responses were then ranked from highest to lowest mean response rating and categorized into qualified support categories. Table 11 summarizes the rankings of the 23 MYP selection criteria actually used and the 23 MYP selection criteria the same contractors proposed for future use.

With the exception of a few variations in the ranks and qualified support categories, the overall rankings of the 23 MYP selection criteria for both actual and proposed usage were very similar. The Wilcoxon rank-sum

Table 11

Mean-Likert Scale Rankings of Actual and Proposed Criteria for MYP Experienced Contractors

OVERALL RANKING OF CRITERIA	ACTUAL MEAN-LIKERT RESPONSE	ACTUAL QUALIFIED SUPPORT CATEGORY*	ACTUAL MEAN-LIKERT RANK	PROPOSED MEAN-LIKERT RANK	PROPOSED QUALIFIED SUPPORT CATEGORY*	PROPOSED MEAN-LIKERT RESPONSE
Availability of Multiyear Funding	6.14		1	1		6.38
Degree of Configuration Stability	5.72		2	3		5.96
Degree of Funding Stability	5.66	FS	3	2		6.06
Amount of Cost Savings Expected	5.54		4	4	FS	5.92
Subcontractor's Production Capacity	5.52		5	8		5.54
Amount of Termination Liability Your Firm Must Assume	5.44		6	6		5.67
Experience Level of Subcontractor	5.34		7	12	GS	5.21
Production Quantities are Stable	5.32		8	5		5.69
Must be in Support of an Ongoing MYP Contract	5.25		9	7	FS	5.65
Past Performance of Subcontractor	5.25		10	10		5.38
Economic Order Quantity Application	5.12		11	11		5.35
Advance Government Funding	4.90		12	9		5.42
Shelf Life of Subcontracted Item	4.88		13	15		5.00
Funding Needs of the Subcontractor	4.78		14	14		5.02
Complexity of Technology	4.54	GS	15	16		4.92
Dollar Size of Subcontract Effort	4.44		16	13		5.06
Length of Subcontract Effort	4.42		17	19	GS	4.79
Capital Investment Commitments by Subcontractors	4.40		18	17		4.92
Potential for Advance Buys	4.33		19	22		4.52
Industry Product Line of Subcontract Effort	4.30		20	23		4.23
Your Firm's Storage Capacity	4.22		21	21		4.56
Number of Potential Competitors	4.20		22	20		4.75
The Number of Shipsets per Production Lot	4.08		23	18		4.49

* Qualified Support Category Abbreviations

FS = FULL SUPPORT
GS = GENERAL SUPPORT
PS = PARTIAL SUPPORT
NS = NO SUPPORT

test was performed to statistically test whether the mean-Likert scale rankings of the 23 MYP selection criteria were significantly different.

Wilcoxon Rank-Sum Test. The Wilcoxon rank-sum test was used to test the null hypothesis (H_0) that the mean-Likert ranking of the 23 MYP selection criteria actually used by contractors was not significantly different from the ranking of the 23 MYP selection criteria the same contractors identified for future use. Based on the research design outlined in Chapter III, the elements of the Wilcoxon test were developed and are summarized in Table 12.

The critical value for the .05 level of significance was determined from the Wilcoxon rank-sum table (27:53). Since the sum of the ranks for the mean-Likert ranking of the MYP selection criteria proposed for future use ($T_{future} = 614$) was less than the critical value ($U = 806$), H_0 (the null hypothesis that no significant difference existed between the mean-Likert scale rankings) was not rejected. Therefore, the rankings of the 23 MYP selection criteria actually used by contractors and the 23 MYP selection criteria proposed for future use by the same contractors were not significantly different.

Table 12

Elements of the Wilcoxon Rank-Sum Test
(Actual/Proposed Criteria)
for MYP Experienced Contractors

Null Hypothesis:

H_o = The probability distributions for the MYP selection criteria actually used and the MYP selection criteria proposed for future use by the same contractors were identical; therefore, the mean-Likert scale rankings of MYP selection criteria actually used in the past and the MYP selection criteria proposed for future use were not significantly different.

Alternate Hypothesis:

H_a = The probability distributions for the MYP selection criteria actually used and the MYP selection criteria proposed for future use by the same contractors were not identical; therefore, the mean-Likert scale rankings of MYP selection criteria actually used in the past and the MYP selection criteria proposed for future use were significantly different.

Test Statistic:

T_{actual} for Criteria Actually Used = 467

T = or

T_{future} for Criteria Proposed for Future Use = 614

Decision Rule:

If $T \geq U = 806$,* reject the null hypothesis (H_o).

* Significance Level of .05 and n=46.

To further test the null hypothesis (H_0) in the Wilcoxon test, an additional level of significance was used to determine if the initial conclusion would be changed. The critical value at the .01 level of significance was determined to be U = 729. The statistical conclusion was the same. The sum of the ranks (T_{future} = 614) was less than the critical value, so H_0 was not rejected. The conclusion reached from the Wilcoxon rank-sum test was that the rankings of the 23 MYP selection criteria actually used by contractors and the 23 MYP selection criteria the same contractors identified for future use were not significantly different.

Research Question 8. Is there a significant difference in the rankings for the 23 MYP selection criteria proposed for future use by MYP experienced and MYP inexperienced contractors?

To evaluate Research Question 8, contractors were asked three questions as outlined in Chapter III, Research Methodology. If the answer to any one of the three questions was "yes," the respondent was considered to be MYP experienced. Of the 110 survey responses, 82 percent indicated that they were experienced in some form of MYP. The identification of MYP experienced and MYP inexperienced contractors was used in the data analysis that follows.

Two tests were used to determine if a significant difference existed in the rankings of MYP selection criteria proposed for future use by MYP experienced and MYP inexperienced contractors. First, the 23 MYP selection criteria were ranked using mean-Likert scale analysis. The mean-Likert scale rankings were compared using the Wilcoxon rank-sum test to determine if a difference existed in the overall rankings of the 23 MYP selection criteria by MYP experienced and MYP inexperienced contractors.

Mean-Likert Scale Analysis. The 23 MYP selection criteria were averaged to form individual mean-Likert responses for each criterion. The mean-Likert responses were ranked from highest to lowest mean response rating and categorized into qualified support categories. Table 13 summarizes the rankings of the MYP selection criteria proposed for future use by MYP experienced and MYP inexperienced contractors.

With the exception of a few anomalies, which are explained as corollary findings, the overall rankings of the 23 MYP selection criteria proposed for future use by MYP experienced and MYP inexperienced contractors were very similar. Only minor variations in individual criterion ranks were visually identified. The Wilcoxon rank-sum test was performed to statistically test

Table 13

Mean-Likert Scale Rankings Proposed for Future Use by MYP Experienced and MYP Inexperienced Contractors

OVERALL RANKING OF CRITERIA	MYP EXPERIENCED			MYP INEXPERIENCED		
	MEAN-LIKERT RESPONSE	QUALIFIED SUPPORT CATEGORY*	MEAN-LIKERT RANK	MEAN-LIKERT RANK	QUALIFIED SUPPORT CATEGORY*	MEAN-LIKERT RESPONSE
Availability of Multiyear Funding	6.40		1	1		6.19
Amount of Cost Savings Expected	5.90		4	2		6.00
Degree of Funding Stability	5.94	FS	2	4		5.81
Degree of Configuration Stability	5.93		3	6	FS	5.56
Amount of Termination Liability Your Firm Must Assume	5.70		5	5		5.81
Advance Government Funding	5.48	GS	7	7		5.56
Production Quantities are Stable	5.48		8	9		5.44
Must be in Support of an Ongoing MYP Contract	5.69	FS	6	17	GS	4.94
Economic Order Quantity Application	5.47		9	8		5.50
Subcontractor's Production Capacity	5.27		10	3	FS	6.00
Past Performance of Subcontractor	5.25		11	14		5.19
Shelf Life of Subcontracted Item	5.10		12	10		5.38
Experience Level of Subcontractor	5.01		13	11		5.38
Funding Needs of Subcontractor	4.96		14	16		5.00
Dollar Size of Subcontract Effort	4.92		15	18		4.88
Complexity of Technology	4.88		16	19	GS	4.88
Length of Subcontract Effort	4.67	GS	18	12		5.31
Capital Investment Commitments by Subcontractors	4.72		17	13		5.31
Potential for Advance Buys	4.64		19	15		5.13
Number of Potential Competitors	4.59		20	20		4.56
Your Firm's Storage Capacity	4.36		21	22	PS	4.00
Industry Product Line of Subcontracted Effort	4.12		23	21	GS	4.31
The Number of Shipsets per Production Lot	4.20		22	23	PS	3.80

* Qualified Support Category Abbreviations

FS = FULL SUPPORT
GS = GENERAL SUPPORT
PS = PARTIAL SUPPORT
NS = NO SUPPORT

whether the mean-Likert scale rankings of the 23 MYP selection criteria were significantly different.

Wilcoxon Rank-Sum Test. The Wilcoxon rank-sum test was used to evaluate the null hypothesis (H_0) that the mean-Likert rankings of the 23 MYP selection criteria for future use were not significantly different for MYP experienced and MYP inexperienced contractors. Based on the research design outlined in Chapter III, the elements of the Wilcoxon test were developed and are summarized in Table 14.

The critical value for the .05 level of significance was determined from the Wilcoxon rank-sum table (27:53). Since the sum of the ranks for the mean-Likert scale ranking of the 23 MYP selection criteria by MYP experienced contractors ($T_{experienced} = 517$) was less than the critical value ($U = 806$), H_0 (the null hypothesis that no significant difference existed between the mean-Likert scale rankings) was rejected. Therefore, the rankings of the 23 MYP selection criteria by MYP experienced and MYP inexperienced contractors were not significantly different.

To further test the null hypothesis (H_0) in the Wilcoxon test, an additional level of significance was used to determine if the initial conclusion would be

Table 14

Elements of the Wilcoxon Rank-Sum Test
for MYP Experienced and MYP Inexperienced Contractors
(Criteria Proposed for Future Use)

Null Hypothesis:

H_0 = The probability distributions for the MYP experienced and MYP inexperienced contractors were identical; therefore, the mean-Likert rankings of MYP selection criteria for MYP experienced and MYP inexperienced contractors were not significantly different.

Alternate Hypothesis:

H_a = The probability distributions for the MYP experienced contractors and MYP inexperienced contractors were not identical; therefore, the mean-Likert rankings of MYP selection criteria for MYP experienced and MYP inexperienced contractors were significantly different.

Test Statistic:

T = $T_{experienced}$ for MYP Experienced Rankings = 517

or

$T_{inexperienced}$ for MYP Inexperienced Rankings = 564

Decision Rule:

If $T > U = 806$,* reject the null hypothesis (H_0).

* Significance Level of .05 and n=46.

changed. The critical value at the .01 level of significance was determined to be U = 729. The statistical conclusion was the same. The sum of the ranks ($T_{experienced}$ = 517) was less than the critical value (U), so H_0 was not rejected. The conclusion from the Wilcoxon rank-sum test was that the rankings of the 23 MYP selection criteria by MYP experienced and MYP inexperienced contractors were not significantly different.

Research Question 9. Is there a significant difference in the rankings for the 23 MYP selection criteria among contractors having different product lines or production activities?

To evaluate Research Question 9, two tests were conducted on the four most significant product line response categories (Aircraft/Helicopters, Missiles, Avionics, and Power Plant/Engines) and the three most significant production activity response categories (Fabrication, Final Assembly and Integration, and Other). First, as outlined in Chapter III, Research Methodology, a mean-Likert scale analysis was performed on the 23 MYP selection criteria for each response category of the product lines and production activities. The mean-Likert scale results for the 23 MYP selection criteria were ranked from highest to lowest mean response for each product line and production activity category. The

Kruskal-Wallis test was used to evaluate the null hypotheses that the mean-Likert scale rankings of the 23 MYP selection criteria for the four product line categories or the three production activity categories were not significantly different. The results of the mean-Likert scale analysis and the Kruskal-Wallis test are discussed in the following sections.

Mean-Likert Scale Analysis. The 23 MYP selection criteria for the four product line categories and the three production activity categories were averaged to form individual mean-Likert responses. The mean responses for the 23 MYP selection criteria for each product line category and each production activity category were ranked from highest to lowest mean response and placed into qualified support categories. Table 15 summarizes the mean-Likert responses, response rankings, and qualified support categories for each criterion in the four product line categories. Table 16 summarizes the mean-Likert scale analysis of the three production activity categories.

The rankings of the 23 MYP selection criteria by the four product lines and the three production activities were not significantly different. The Kruskal-Wallis test was performed to evaluate the null hypotheses (H_0) that the mean-Likert scale rankings of

Table 15

Mean-Likert Scale Rankings of Proposed Criteria for Different Product Lines

OVERALL RANKING OF CRITERIA	AIRCRAFT/HELICOPTER			MISSILES			AVIONICS			POWER PLANT/ENGINES		
	MEAN-LIKERT RANK	MEAN-LIKERT RESPONSE	QUALIFIED SUPPORT CATEGORY*	MEAN-LIKERT RANK	MEAN-LIKERT RESPONSE	QUALIFIED SUPPORT CATEGORY*	MEAN-LIKERT RANK	MEAN-LIKERT RESPONSE	QUALIFIED SUPPORT CATEGORY*	MEAN-LIKERT RANK	MEAN-LIKERT RESPONSE	QUALIFIED SUPPORT CATEGORY*
Availability of Multiyear Funding	1	6.52	FS	1	6.53	FS	1	6.43	FS	4	5.92	FS
Degree of Configuration Stability	3	6.09		2	6.18		2	6.00		2	6.00	
Degree of Funding Stability	5	5.96		3	6.06		5	5.68		3	6.00	
Amount of Cost Savings Expected	2	6.22		4	6.00		6	5.65		7	5.87	
Subcontractor's Production Capacity	6	5.96		13	5.35	GS	3	5.86		9	5.46	GS
Amount of Termination Liability Your Firm Must Assume	9	5.52		9	5.71		8	5.43	GS	5	5.92	
Experience Level of Subcontractor	8	5.55		6	5.88		13	4.92		7	5.87	
Production Quantities are Stable	11	5.43	GS	7	5.88	FS	4	5.86	FS	1	6.25	FS
Must Be in Support of an Ongoing MYP Contract	10	5.52	FS	8	5.82		9	5.31	GS	8	5.64	
Past Performance of Subcontractor	4	6.04		5	6.06		11	5.21		10	5.31	
Economic Order Quantity Application	13	5.26	GS	15	5.24		7	5.64	FS	11	5.00	
Advance Government Funding	7	5.78	FS	17	5.06		18	4.77		12	4.92	
Shelf Life of Subcontracted Item	14	5.26		11	5.41	GS	10	5.23		16	4.58	
Funding Needs of the Subcontractor	15	5.22		12	5.41		14	4.92		14	4.83	
Complexity of Technology	12	5.30		16	5.12		15	4.92		17	4.50	GS
Dollar Size of Subcontract Effort	17	5.30		20	4.65		16	4.92		18	4.50	
Length of Subcontract Effort	16	5.04		10	5.65	FS	20	4.58	GS	19	4.25	
Capital Investment Commitments by Subcontractors	18	4.91	GS	14	5.29		17	4.83		20	4.17	
Potential for Advance Buys	21	4.26		21	4.65		12	5.14		13	4.85	
Industry Product Line of Subcontract Effort	20	4.35		18	4.76	GS	19	4.71		15	4.69	
Your Firm's Storage Capacity	19	4.74		22	4.41		23	3.69	PS	23	3.67	
Number of Potential Competitors	22	4.22		23	4.06		21	4.08	GS	21	3.92	PS
The Number of Shipsets per Production Lot	23	3.68	PS	19	4.76		22	3.77	PS	22	3.75	

* Qualified Support Category Abbreviations

FS = FULL SUPPORT
GS = GENERAL SUPPORT
PS = PARTIAL SUPPORT
NS = NO SUPPORT

Table 16

Mean-Likert Scale Rankings of Proposed Criteria for Different Production Activities

OVERALL RANKING OF CRITERIA	FABRICATION			FINAL ASSEMBLY/INTEGRATION			OTHER (COMBINATION)		
	MEAN-LIKERT RANK	MEAN-LIKERT RESPONSE	QUALIFIED SUPPORT CATEGORY*	MEAN-LIKERT RANK	MEAN-LIKERT RESPONSE	QUALIFIED SUPPORT CATEGORY*	MEAN-LIKERT RANK	MEAN-LIKERT RESPONSE	QUALIFIED SUPPORT CATEGORY*
Availability of Multiyear Funding	1	5.85	FS	1	6.46		1	6.48	
Degree of Configuration Stability	2	5.76		3	5.91		2	6.15	
Degree of Funding Stability	4	5.47	GS	2	6.04	FS	3	6.03	
Amount of Cost Savings Expected	3	5.55	FS	4	5.87		4	6.00	
Subcontractor's Production Capacity	9	5.29		5	5.76		6	5.91	FS
Amount of Termination Liability Your Firm Must Assume	10	5.29		9	5.36		5	5.97	
Experience Level of Subcontractor	11	5.20		6	5.43		8	5.76	
Production Quantities are Stable	6	5.38		7	5.38		7	5.78	
Must Be in Support of an Ongoing MYP Contract	5	5.43		8	5.38		9	5.63	
Past Performance of Subcontractor	7	5.33		10	5.36		10	5.58	
Economic Order Quantity Application	8	5.33		13	5.13		12	5.33	GS
Advance Government Funding	15	4.86		14	5.07		11	5.53	FS
Shelf Life of Subcontracted Item	12	5.00	GS	11	5.15		14	5.18	
Funding Needs of the Subcontractor	17	4.45		15	5.00	GS	13	5.27	
Complexity of Technology	19	4.30		12	5.15		15	5.12	
Dollar Size of Subcontract Effort	13	5.00		17	4.80		17	4.94	
Length of Subcontract Effort	18	4.40		16	4.87		16	5.03	GS
Capital Investment Commitments by Subcontractors	16	4.70		18	4.75		19	4.88	
Potential for Advance Buys	14	4.90		19	4.67		20	4.73	
Industry Product Line of Subcontract Effort	21	4.19		20	4.56		18	4.94	
Your Firm's Storage Capacity	23	3.95	PS	21	4.33		21	4.36	
Number of Potential Competitors	22	4.15	GS	22	4.16		22	4.24	
The Number of Shipsets per Production Lot	20	4.20		23	4.12		23	4.09	

* Qualified Support Category Abbreviations

FS = FULL SUPPORT
GS = GENERAL SUPPORT
PS = PARTIAL SUPPORT
NS = NO SUPPORT

the 23 MYP selection criteria by the four product lines and three production activities were not significantly different.

Kruskal-Wallis Test. The Kruskal-Wallis test was used to determine if the mean-Likert scale rankings of the 23 MYP selection criteria by the four product lines and three production activities were significantly different. The procedures used to conduct the Kruskal-Wallis test for the analysis of the different product lines and production activities were outlined in Chapter III, Research Methodology, and are summarized in Table 17 and Table 18.

The critical values for the .05 level of significance were determined from the chi square distribution table (27:42). Since the product line test statistic (H = 3.478) was less than the product line critical value (χ^2 = 7.815) and the production activity test statistic (H = 4.468) was less than the production activity critical value (χ^2 = 5.991), the null hypotheses for the product line and production activity were not rejected. Therefore, the rankings of the 23 MYP selection criteria by the four product lines and by the three production activities were not significantly different.

Table 17

Elements of Kruskal-Wallis Test
(Product Lines)

Null Hypothesis:

H_0 = The probability distributions for the four most significant product line response categories were identical; therefore, the mean-Likert scale rankings of MYP selection criteria for the four product lines were not significantly different.

Alternate Hypothesis:

H_a = At least one of the probability distributions for the four most significant product line response categories was not identical to the other probability distributions; therefore, the mean-Likert scale rankings of MYP selection criteria used by the contractors in at least one of the four product lines was significantly different.

Test Statistic:

$$H = \frac{12}{n(n+1)} \sum_{j=1}^{k} \frac{R_j^2}{n_j} - 3(n+1) = 3.478$$

where:

n_j = Number of measurements in sample j.

R_j = Rank-sum for sample j, where the rank of each measurement is computed according to its relative magnitude in the totality of data for the k samples.

n = Total sample size = $n_1 + n_2 + ..+ n_k$.

k = Number of probability distributions being compared.

Decision Rule:

If $H > \chi^2 = 7.815$,* reject the null hypothesis (H_0).

* Significance Level of .05 and 3 degrees of freedom.

Table 18

Elements of Kruskal-Wallis Test
(Production Activities)

Null Hypothesis:

H_o = The probability distributions for the three most significant production activity categories were identical; therefore, the mean-Likert scale rankings of the MYP selection criteria for the three production activities were not significantly different.

Alternate Hypothesis:

H_a = At least one of the probability distributions for the three most significant production activity categories was not identical to the other probability distributions; therefore, the MYP selection criteria used by the contractors in at least one of the three production activities were significantly different.

Test Statistic:

$$H = \frac{12}{n(n+1)} \sum_{j=1}^{k} \frac{R_j^2}{n_j} - 3(n+1) = 4.468$$

where:

n_j = Number of measurements in sample j.

R_j = Rank-sum for sample j, where the rank of each measurement is computed according to its relative magnitude in the totality of data for the k samples.

n = Total sample size = $n_1 + n_2 + ..+ n_k$.

k = Number of probability distributions being compared.

Decision Rule:

If $H > \chi^2 = 5.991$,* reject the null hypothesis (H_o).

* Significance Level of .05 and 2 degrees of freedom.

Summary of Primary Findings

The primary findings presented in the preceding sections outlined the results of the analysis of the nine research questions. The research results identified the characteristics of MYP contracts and subcontractors using MYP at the subcontractor level. The MYP subcontract is characterized as a firm fixed price contract for less than $10 million to be completed in less than three years. The MYP subcontract is typically a competitive or follow-on procurement for completely designed hardware in the third or subsequent production lot. MYP subcontractors are characterized as small, highly experienced businesses, that are spread throughout many industries within the defense industrial base.

An overall set of MYP selection criteria were identified for defense contractors to use when contemplating placing MYP subcontracts. The ranking of the 23 MYP selection criteria was supported by test results which indicated that:

1. There was not a significant difference in the overall rankings of the 23 MYP selection criteria proposed for future use by MYP experienced and MYP inexperienced contractors;

2. There was not a significant difference in the overall rankings of the 23 MYP selection criteria by contractors functioning in different product lines or production activities; and

3. There was not a significant difference in the overall ranking of the 23 MYP selection criteria actually used by MYP experienced contractors and the ranking of the 23 MYP selection criteria the same contractors proposed for future use.

Corollary Findings

The objectives of the authors' research effort were to determine: (1) the extent that MYP contracts are used in support of DOD programs, (2) the contract and subcontractor characteristics associated with the use of MYP at the subcontractor level, and (3) the selection criteria that contractors consider important when contemplating the placement of MYP subcontracts to lower-tier subcontractors. The primary findings presented in the preceding sections of this chapter directly answered the research questions associated with the above research objectives. The corollary findings, described in this section, provide additional support for the research conclusions.

First Corollary Finding

One of the authors' research objectives was to determine the MYP selection criteria contractors considered important when contemplating the placement of a MYP subcontract to a lower-tier subcontractor. To support the development of MYP selection criteria, a number of comparative tests were conducted to determine if the mean-Likert scale rankings of the 23 MYP selection criteria were different based on MYP experience, product lines, production activities, or actual MYP use. Although the statistical results of the comparative analysis indicated that no significant differences existed in the rankings of the MYP selection criteria, some anomalies were identified which are worth highlighting. A summary of these anomalies is provided in the next section.

Analysis of MYP Experienced and MYP Inexperienced Contractors. The rankings of the 23 MYP selection criteria by the MYP experienced and MYP inexperienced contractors were predominantly the same. However, the rankings of two specific criteria by the MYP inexperienced contractors deviated noticeably from the rankings provided by MYP experienced contractors. The two criteria were "must be in support of an ongoing MYP contract" and "subcontractor's production capacity."

Must be in Support of an Ongoing MYP Contract. The mean-Likert scale ranking of this criterion for the MYP inexperienced contractors deviated from the ranking developed from MYP experienced contractors by 11 positions. The criterion was ranked number 6 by MYP experienced contractors and number 17 by MYP inexperienced contractors. MYP inexperienced contractors did not consider having an ongoing MYP contract as important as MYP experienced contractors. The MYP inexperienced contractors must not have realized the benefits associated with having an ongoing MYP contract to support a MYP subcontract. The benefits of having an ongoing MYP contract include: (1) stability of requirements, configuration, and funding; (2) the ability to flow down MYP funding to support the subcontracted effort; and (3) the ability to cover MYP termination liabilities associated with the MYP subcontract. The MYP selection criteria dealing with funding, stability, and termination liability were ranked as the most important criteria for considering the use of a MYP subcontract by all respondents in the research study.

Subcontractor's Production Capacity. Using the mean-Likert scale analysis, MYP inexperienced contractors ranked the criterion "subcontractor's production capacity" much higher (number 3) than the

ranking by MYP experienced contractors (number 10). The difference in the ranking may have been because MYP experienced contractors considered the use of MYP for subcontracted effort as a means of expanding the subcontractor's production capacity. The use of MYP should encourage a subcontractor to invest in capital improvements which would expand the subcontractor's production capacity. By providing a subcontractor with more knowledge of future requirements through the use of a multiyear contract, the prime contractor would be encouraging the subcontractor to invest in sufficient capital to meet production needs.

Summary of Other Analyzed Categories. The overall mean-Likert scale rankings of the 23 MYP selection criteria by different product lines, production activities, and actual versus future MYP use were not significantly different, as verified by statistical analyses. However, the ranking for any one criterion within each category may be noticeably different from the rankings of the same criterion for the other product line or production activity categories. Although the ranking for any one criterion in each category may have been different, the causes for the deviations within each category were not obvious and could not be ascertained by the researchers.

Second Corollary Finding

The corollary findings presented in this section are the result of written open-ended comments provided by respondents to the survey instrument. Two major topics were considered important by the survey respondents: (1) subcontract MYP funding issues and (2) Congressional support issues.

Subcontract MYP Funding. A major constraint to the use of MYP for subcontracted effort is the lack of funding and the cash flow problems which could result from the use of MYP at the subcontractor level. Currently, there are no provisions for a prime contractor to cover funding requirements for a MYP subcontract without the prime contractor also having a MYP contract. In many cases, the subcontracted item meets all the criteria identified for MYP use (e.g., cost benefit, stable requirement, and stable configuration), but the prime contractor is usually not willing to use a MYP subcontract without some form of commitment by the Government to cover the subcontract MYP funding requirements.

The importance of the subcontract MYP funding issue is highlighted by the fact that four of the top six ranked MYP selection criteria identified by this research project deal with MYP subcontract funding. Potential MYP subcontracts are not always in support of

a MYP prime contract. Often, the subcontracted effort is a good MYP candidate, but without a MYP prime contract the prime contractor is unwilling or unable to accept the added risk created by the use of MYP for subcontractors.

A second funding issue that respondents indicated as a concern dealt with the ability to flow down economic price adjustment (EPA) clauses. As reflected in the MYP subcontractor characteristics identified in this research, many of the MYP subcontractors are small businesses. The small subcontractor often supplies a variety of parts and subassemblies to a variety of contractors. By using a MYP contract, the subcontractor is committing a major portion of the firm's resources to an individual program for future years' requirements. If economic conditions deteriorate and the subcontractor is not protected by EPA clauses in the MYP contract, a potential exists for a substantial financial loss or even bankruptcy.

Congressional Support. A majority of the responses from the field survey characterized MYP as one of the most effective cost reduction/cost control tools for production programs. However, since Congress has been so reluctant to release MYP funding control, the

MYP initiative has, in some cases, increased the costs of weapon system acquisitions. The cost increase has occurred because of the increased administrative costs resulting from the submission of MYP proposals which are ultimately unfunded. Survey respondents considered increased Congressional support as mandatory for MYP survival.

Summary

Chapter IV presented the research findings obtained from applying the research methodology described in Chapter III. This chapter outlined the primary and corollary findings from the tests performed to address the three research objectives and the nine research questions.

The research results identified the MYP contract and subcontractor characteristics associated with the use of MYP at the subcontractor level and highlighted the need for greater attention to subcontract MYP funding needs and Congressional support for MYP.

The research findings also provided an overall ranking of the 23 MYP selection criteria, supplemented by an additional list of criteria identified by respondents, which should be considered when contemplating the use of MYP with lower-tier subcontractors. The test results indicated that:

1. There was not a significant difference in the overall rankings of the 23 MYP selection criteria by MYP experienced and MYP inexperienced contractors;

2. There was not a significant difference in the overall rankings of the 23 MYP selection criteria by contractors functioning in different product lines or production activities; and

3. There was not a significant difference in the overall ranking of the 23 MYP selection criteria actually used by contractors and the ranking of the 23 MYP selection criteria the same contractors identified for future use.

In the final chapter, implications of the research findings, the authors' conclusions, and recommendations are presented.

CHAPTER V

IMPLICATIONS, CONCLUSIONS, AND RECOMMENDATIONS

Introduction

The primary objective of the research project was to determine the criteria used by defense contractors to select lower-tier subcontractors for multiyear procurement (MYP) subcontracts. Previous chapters discussed the research problem, MYP associated literature, research methodology, and research findings. This final chapter summarizes the authors' research project, conclusions, and recommendations. First, the MYP background, research objectives, and research methodology are summarized. Following the research summary is a discussion of the implications and conclusions resulting from the data analysis of the field survey instrument responses as related to the research objectives and research questions. Recommendations for both implementation and future research will finalize the chapter.

Summary of Background, Objectives, and Methodology

In recent years, the defense industry has been characterized by such alarming trends as: (1) declining

productivity, (2) declining subcontractor industrial base, and (3) increasing weapon system cost overruns (18:39, 138; 1:149). MYP has been cited as an acquisition strategy that can be used to effectively address these alarming defense industry trends (7:121; 35:620). The use of MYP should provide long-term incentives for the contractor to invest in laborsaving facilities, purchase components and raw materials in economic quantities to reduce lead-times and promote savings, and perform assembly and subcontracting in the most efficient and economical manner (29:6).

As reported in Chapter II of this research project, the Government has established criteria for the selection of MYP prime contractors. However, the criteria used by the Government are not necessarily the same selection criteria used by prime contractors when evaluating lower-tier contractors for MYP subcontracts. By understanding the MYP selection criteria used by contractors to evaluate potential MYP subcontractors, the Department of Defense (DOD) may be able to retard the previously mentioned defense industry trends (7:121).

The authors developed three research objectives for this research project. The authors wished to (1) determine the extent that MYP contracts are being used in support of DOD programs, (2) identify the

contract and subcontractor characteristics associated with the use of MYP at the subcontractor level, and (3) determine the selection criteria that contractors consider important when contemplating the placement of MYP subcontracts to lower-tier subcontractors.

A field survey questionnaire was developed to gather the necessary data to accomplish the authors' research objectives. A total of 550 field survey instruments were sent to a sample of 110 defense contractors. In an attempt to increase the response rate, two survey instruments were sent to the vice presidents of five management functional areas within each firm. To eliminate duplicate responses from a functional area within a particular firm, the most complete survey instrument was selected for data analysis.

All survey respondents were asked to provide the researchers with data related to the (1) individual respondent, (2) respondent's firm, and (3) selection criteria used when considering MYP subcontracts with lower-tier subcontractors. In addition to the above information, respondents experienced in the use of MYP were asked to provide data related to the (1) MYP subcontract, (2) MYP subcontractor, and (3) the selection criteria actually used to place MYP subcontracts with lower-tier subcontractors.

The resulting data were analyzed to evaluate the research questions developed to support each research objective. The following data analysis techniques were used to evaluate each research question: (1) descriptive analysis, (2) mean-Likert scale analysis, (3) Wilcoxon rank-sum test, and (4) Kruskal-Wallis one-way analysis of variance test. The results and findings of the data analysis were discussed in Chapter IV. The implications and conclusions drawn from the research findings are discussed in the following section.

Implications and Conclusions

Research Objectives

The three research objectives were formulated to guide the authors' research project. The research findings for the three research objectives support the following conclusions:

1. Within the defense industrial base, multiyear procurement (MYP) is used to a limited extent at the prime contractor and subcontractor levels;

2. There is a common set of characteristics associated with the MYP subcontract and MYP subcontractor within the defense industrial base; and

3. There is significant commonality in the criteria used by defense industrial base contractors to select lower-tier MYP subcontractors.

The specific implications and conclusions associated with each research question are discussed in the following sections.

Research Question 1. Research Question 1 was developed to determine the percentage of contractors' sales dollars obtained through a MYP contract. The survey results indicated that, for all defense industrial base contractor tier levels, only a small percentage of contractors' sales dollars are being obtained through the use of MYP.

Research Question 2. The purpose of Research Question 2 was to determine the percentage of contractors' subcontracted efforts provided to lower-tier subcontractors through MYP. Most of the responding contractors (56.8 percent) indicated that less than one percent of their subcontracted efforts were provided to lower-tier subcontractors through MYP. The findings for Research Question 2 confirmed the findings presented for Research Question 1. MYP is not being used extensively as an acquisition strategy for DOD programs within the defense industrial base.

Research Question 3. The characteristics of MYP subcontracts identified in the authors' research findings, Chapter IV, were similar to the researchers' expectations. The most common characteristics of an MYP subcontract are summarized as: (1) a firm fixed price contract, (2) for an amount less than $10 million, (3) to be completed in less than three years, (4) in a competitive or follow-on environment, (5) where the hardware (product) is 100 percent designed, and (6) in the third or subsequent production lot.

Research Question 4. Research Question 4 dealt with the characteristics of subcontractors who receive MYP subcontracts. The most common MYP subcontractor characteristics identify the typical MYP subcontractor as: (1) a small business, (2) that is highly experienced, and (3) found in a variety of defense-related industries.

There was a high percentage of MYP subcontractors identified within the electronics/avionics industry. The large number of MYP subcontractors from the electronics/avionics industry was not considered unusual by the researchers, because a large number of surveys were received from the electronics/avionics industry.

Research Question 5. Research Question 5 was used to determine the selection criteria that contractors

actually used when contemplating the placement of MYP subcontracts with lower-tier subcontractors. The mean-Likert analysis of the survey responses identified five MYP selection criteria which provided "full support" to a decision to place MYP subcontracts with lower-tier subcontractors. The five criteria listed in descending order of importance were: (1) availability of multiyear funding, (2) degree of configuration stability, (3) degree of funding stability, (4) amount of cost savings expected, and (5) subcontractor's production capacity. The availability of multiyear funding was the MYP selection criterion that contractors gave the most consideration to when contemplating the placement of MYP subcontracts to lower-tier subcontractors.

The number two criterion identified in the mean-Likert scale analysis (degree of configuration stability) supported the findings obtained from evaluating Research Question 3. The findings from evaluating Research Question 3 indicated that most MYP subcontracts are for hardware that is 100 percent designed. It would be unreasonable to expect a contractor to place a MYP subcontract with a lower-tier subcontractor for a product where the design is continually being modified.

Contractors are also very concerned with funding stability. If Congress decides to reduce the funds for a program after the subcontractor has obligated funds for long-term resources, the prime contractor or subcontractor could suffer a major financial loss or even bankruptcy.

The amount of cost savings and the long-term production capacity of the subcontractor were also MYP selection criteria considered to require full consideration when making a decision to use MYP subcontracts.

Research Question 6. The purpose of Research Question 6 was to determine the selection criteria that contractors consider important when contemplating the use of MYP for future subcontracts to lower-tier subcontractors. The five "full support" criteria identified for Research Question 6 are repeated in descending order of importance as follows: (1) availability of multiyear funding, (2) amount of cost savings expected, (3) degree of funding stability, (4) degree of configuration stability, and (5) amount of termination liability which must be assumed by the contractor.

Four of the five "full support" criteria actually used for MYP subcontractor selection (Research Question 5) were the same selection criteria considered important

for future MYP subcontractor selection. The fifth criterion, "amount of termination liability which must be assumed by the contractor," appears to indicate that contractors have a great concern for the risk associated with the use of future MYP subcontracts. Contractors are reluctant to utilize MYP for subcontracted effort without a Government commitment to provide MYP funding and termination liability coverage for MYP subcontracted efforts.

Research Question 7. Based on the findings from the previous two research questions, Research Question 7 was used to determine if the ranking of the MYP selection criteria actually used and the ranking of MYP selection criteria proposed for future use by the same contractors were significantly different. The objective of Research Question 7 was to determine if conditions actually encountered by defense contractors in previous MYP subcontracts would alter the selection criteria the same contractors proposed for MYP subcontracts in the future.

The following hypotheses were formulated to test the difference in the two sets of rankings:

H_0 = The probability distributions for the MYP selection criteria actually used and the MYP selection criteria proposed for future use by the same contractors were identical.

H_a = The probability distributions for the MYP selection criteria actually used and the MYP selection criteria proposed for future use by the same contractors were not identical.

With the exception of minor variations in the ranking of individual criterion, the overall rankings for the 23 MYP selection criteria were not significantly different. Since the null hypothesis (H_o) was not rejected, the empirical findings of the statistical tests for the above hypotheses supported a conclusion that there was not a significant difference in the rankings of the 23 MYP selection criteria actually used by contractors and the 23 MYP selection criteria identified for future use by the same contractors.

Research Question 8. The purpose of Research Question 8 was to determine if being experienced in MYP would cause a contractor to rank the 23 MYP selection criteria differently than a contractor with no MYP experience. The hypotheses formulated to evaluate the rankings of MYP selection criteria were:

H_o = The probability distributions for the MYP experienced and MYP inexperienced contractors were identical.

H_a = The probability distributions for the MYP experienced contractors and MYP inexperienced contractors were not identical.

Again, the rankings of the 23 MYP selection criteria contained minor variations but were not significantly

different. Since the null hypothesis (H_0) was not rejected, the empirical findings of the statistical tests for the above hypotheses support a conclusion that there was not a significant difference in the rankings of the 23 MYP selection criteria identified by both MYP experienced and MYP inexperienced contractors.

Research Question 9. Research Question 9 was used to determine if a significant difference existed in the rankings of the 23 MYP selection criteria among contractors having different product lines or production activities. The hypotheses formulated to test this research question were:

1. For the product lines:

   H_0 = The probability distributions for the four most significant product line response categories were identical.

   H_a = At least one of the probability distributions for the four most significant product line response categories was not identical to the other probability distributions.

2. For the production activities:

   H_0 = The probability distributions for the three most significant production activity categories were identical.

   H_a = At least one of the probability distributions for the three most significant production activity categories was not identical to the other probability distributions.

Since the null hypotheses (H_0) were not rejected, the empirical findings supported a conclusion that there were not significant differences in the rankings of the 23 MYP selection criteria identified by contractors having different product lines or production activities.

The empirical findings for the statistical tests supported a conclusion that the ranking of the 23 MYP selection criteria identified for Research Question 6 (see Table 9, Page 88) was the overall ranking of MYP subcontractor selection criteria considered most important by defense contractors contemplating the use of MYP for future subcontracts.

Recommendations

As the research findings indicated, a number of selection criteria must be considered before a decision is made to use MYP for subcontracted effort. Contractors from all defense industry tier levels are concerned about the potential risks associated with the use of MYP at the subcontractor level. The political and economic uncertainties, which have become a part of defense business, have placed greater risks on the use of MYP subcontracts, particularly for programs that are funded annually. The key evaluation criteria identified by defense contractors deal with the perceived stability of

requirements, funding, and design configuration. During this research study on MYP subcontract selection criteria, two areas of recommendation have emerged. First, some specific recommendations for implementation are discussed. Second, some recommendations for future research are provided to help channel additional research projects in the area of multiyear procurement.

Recommendations for Implementation

After examining the primary findings, corollary findings, and conclusions, four recommendations for implementation were formulated.

Expanded Use of MYP. The primary and corollary findings presented in Chapter IV highlighted a prioritized list of MYP selection criteria for use when considering the placement of MYP subcontracts. The prioritized list of MYP selection criteria is provided in Table 9 (Page 87). The top eight MYP selection criteria deal with funding and stability issues which are often beyond the control of the contractor. However, seven of the eight criteria can be directly or indirectly influenced by commitments made by the Government through prime contracts.

The Government's commitment to the expanded use of MYP for subcontracts should be implemented in the following four ways:

1. The Government should provide greater stability in the number of weapon system requirements. By stabilizing the requirements for a particular weapon system, the requirements for subsystems comprising the weapon system will become more stable;

2. If the requirements for a weapon system are stabilized, the funding necessary to support MYP subcontracted efforts for the program should be made available by the Government;

3. The design configuration for subassemblies should be stabilized as early as possible in the acquisition process; and

4. If the Government is committed to a particular weapon system program, the Government should be willing to accept some risk for termination liability.

Without a Government commitment to stabilize requirements, funding, and design configuration, defense contractors are unwilling to commit to MYP subcontracts. Presently, the primary method that provides the Government commitment necessary to incentivize prime contractors to place MYP subcontracts is the Government's MYP contract with prime contractors.

The researchers recommend that the Government commit to the use of MYP as an acquisition strategy by encouraging MYP use where practical. The Government

should strive to place more MYP contracts at the prime contractor level for programs meeting MYP selection criteria identified by the Defense Acquisition Regulation (DAR). The Government should also attempt to stabilize weapon system programs to encourage the use of MYP at the subcontractor level as early as possible in the acquisition cycle and incentivize prime contractors to use MYP where appropriate.

Interest as an Allowable Cost. The ability of MYP to achieve the desired result of stimulating the defense industrial base is based on the assumption that contractors using MYP will take advantage of the multiyear contract to make capital investments. Although the stability that accompanies MYP provides the contractor the opportunity to make capital investments, the actual capital investment decision is often tied to other factors, such as the prevailing interest rate or the availability of internal corporate financing.

The findings presented in Chapter IV indicated that contractors contemplating the use of MYP subcontracts are very concerned about the risks associated with MYP subcontract funding, stability of requirements, stability of design configuration, and the termination liability that must be assumed by their firm. Other concerns, which were identified by contractors, included the interest

rate and cost of borrowing which prevails at the time of the MYP subcontract decision.

Currently, DAR considers interest expense an unallowable cost for defense contracts. By disallowing the recoupment of interest expenses, the Government is actually discouraging contractors from investing in capital equipment. The lack of incentive to invest in capital equipment is particularly contradictory to the purpose of MYP.

The researchers recommend that the Defense Acquisition Regulation be changed to allow contractors to be reimbursed for interest expense for capital investments which provide documented cost savings on defense programs.

MYP Funding for Subcontract Effort. As the findings presented in Chapter IV vividly illustrated, contractors considering the use of MYP for subcontracted effort are very concerned about the ability to obtain MYP funding to support the MYP subcontract. Currently, the only method available for contractors to obtain MYP subcontract funding is from a MYP contract existing between the Government and the prime contractor. In many cases, the work being considered for a MYP subcontract will meet all the MYP selection criteria except the ability to provide MYP funding. If the subcontracted work

does not support a program which has a MYP contract at the prime contractor level, the contractor or subcontractor must assume the responsibility for financing the multiyear effort.

Associated with the inability of contractors to claim interest expense on defense contracts as an allowable cost and the contractors' need to satisfy a number of internal financing requirements (e.g., capital investment, dividends, and growth), contractors generally are not willing to assume the added risks associated with MYP subcontracts without some commitment from the Government.

The researchers recommend that the Government provide limited and controlled MYP subcontract funding commitments to contractors supporting single-year defense programs.

MYP Use in Conjunction With Component Breakout. Component breakout has been identified as a means of increasing competition at the subcontractor level while providing cost savings to the Government. Many of the criteria used to identify components for potential breakout (e.g., design stability and requirements stability) are also criteria which have been identified for selection of MYP programs. If the requirements for MYP use were relaxed to provide the opportunity to use MYP

in conjunction with component breakout, the Department of Defense could achieve compounded benefits due to the complementary nature of MYP and component breakout.

The researchers recommend that Congress delegate to the Department of Defense the authority necessary to use MYP in conjunction with component breakout decisions.

Recommendations for Future Research

The extensive use of MYP as an acquisition strategy is relatively new and has had limited applications to date. A majority of the research studies conducted on MYP have been conducted to gain a better understanding of the advantages, disadvantages, and criteria used to select MYP programs. The knowledge gained from the authors' research project and previous research studies provides the framework necessary for additional meaningful research in the area of MYP. Five specific areas for future research are briefly described in subsequent sections.

Analysis of Termination Liability. One of the MYP selection criteria identified by contractors as an important consideration when contemplating the use of

MYP for subcontracted effort was the amount of termination liability the contractor must assume using MYP subcontracts. The 1982 DOD Authorization Act increased the termination liability the Government could assume to $100 million. A meaningful research study should be conducted to survey defense contractors currently using MYP contracts to determine if the present MYP termination liability ceiling is adequate to cover the increased termination liability requirements created by MYP subcontracts. Additionally, the research project should address whether or not the present MYP termination liability ceiling discourages MYP prime contractors from using MYP subcontracts for subcontracted work.

MYP Subcontract Funding. As discussed in Chapter IV, the ability of a contractor to obtain MYP subcontract funding is a key concern for contractors contemplating the use of MYP for subcontracted work. Currently, there are no provisions to provide MYP subcontract funding support to prime contractors that depend on single-year funding authorizations. Many of the subcontracted subassemblies for a single-year prime contract would meet all the MYP subcontract selection criteria identified by this research project with the exception of MYP subcontract funding. An important

research effort would be to determine if there is Government support for a contract funding clause designed to provide Government MYP subcontract funding through a single-year prime contract.

Analysis of Termination Liability Funding. A major problem which has prevented the extensive use of MYP for major weapon system acquisitions is the inability of the Government to determine the type of funding method which should be used to fund the termination liability associated with MYP. A study of the advantages and disadvantages of different MYP termination funding methods should concentrate on the objective of finding the best funding method.

MYP Subcontract Incentives. Based on the MYP selection criteria identified in this research project, initiatives need to be developed to determine the most appropriate method to incentivize prime contractors to subcontract to lower-tier subcontractors using MYP. An important follow-on research project would be to survey Government buying activities to develop a set of incentives which could be used to influence prime contractors to use MYP at the subcontract level where appropriate.

MYP Subcontract Selection Criteria Validation. The primary finding of this research project was a list of 23 prioritized MYP selection criteria to be used by

contractors when considering the use of MYP for subcontracts. A follow-on research study is needed to validate the ranking of the 23 MYP selection criteria obtained through the authors' research effort and to determine if other selection criteria should be considered.

Concluding Observations

The findings, implications, and conclusions presented in the authors' research project provide the framework necessary to understand what motivates defense contractors to use MYP subcontracts with lower-tier subcontractors. However, it is just a beginning. As the research results indicated, MYP is not being used extensively for DOD programs. Many problems must be solved before MYP can be used effectively as an acquisition strategy, especially at the subcontractor level. Although the MYP advantages, disadvantages, and selection criteria are well documented, extensive research is still necessary to eliminate problems associated with MYP funding and termination liability coverage at the subcontractor level. Since these and other areas of concern need further investigation, it is hoped that this study will serve as a catalyst for further research of MYP issues.

APPENDICES

APPENDIX A

DEFINITIONS

Advance Procurement. An exception to the full-funding policy which allows procurement of long lead-time items (advanced long-lead procurement) or economic order quantities (EOQ) of items (advance EOQ procurement) in a fiscal year (FY) in advance of that year in which the related end item is to be acquired. Advance procurements may include materials, parts, and components as well as costs associated with the further processing of those materials, parts, and components.

Annual Funding. The current Congressional practice of limiting authorizations and appropriations to one fiscal year at a time. The term should not be confused with 2-year or 3-year funds which provide the Executive Branch with more than 1 year to obligate the funds.

Block Buy. Buying more than 1 year's requirement under a single year's contract. A total quantity is contracted for in the first contract year. Block buys may be funded to the termination liability or fully funded.

Cancellation. A term unique to multiyear contracts. The unilateral right of the Government not to continue contract performance for subsequent fiscal years' requirements. Cancellation is effective only upon the failure of the Government to fund successive FY requirements under the contract. Cancellation is not the same as termination.

Cancellation Ceiling. Cancellation ceiling is the maximum price the Government will pay the contractor upon cancellation. The cancellation ceiling is equal to the contract price which the contractor would have recovered as a part of the unit price had the contract been completed. The amount which is actually paid to the contractor upon settlement for unrecovered costs (which can only be equal to or less than the ceiling) is referred to as the cancellation charge. This ceiling includes both recurring and non-recurring costs.

Expenditure Funding. Involves funding to cover the contractor's expenditures. The termination costs are not included or funded using this approach. If a contract was terminated, additional funds would be necessary to cover the termination costs.

Full Funding. Funds are available at the time of award to cover the total estimated costs to deliver a given quantity of complete, militarily usable end items or services. Under current policy, the entire funding needs of the fiscal year's production quantity must be provided unless an exception for advance procurement has been approved. To test if the acquisition is fully funded, determine if the single-year's buy depends on a future year's appropriation to complete delivery. If the answer is yes, the contract is probably not fully funded. The principle of full funding applies only to production contracts and not to research and development contracts.

Incremental Funding. Funds are not available at the time of contract award to complete a fiscal year's quantity of end items in a finished, militarily usable form. Future year appropriations are required in order to complete the items or tasks. Incremental funding is commonly used for development programs.

Level Unit Price. In a multiyear contract, the first unit produced carries the same price as the last unit produced.

Multiyear Contract. A contract covering more than one but not more than five years of requirements. Each program year is budgeted and funded annually. At the time of contract award, funds need to be appropriated for the first year only. The contractor is protected against loss resulting from cancellation by contract provisions that allow reimbursement of costs included in the cancellation ceiling.

Multiyear Experienced Contractor. Contractors are considered to be MYP experienced contractors if they have: (1) participated in a MYP contract in the past, (2) submitted a MYP cost or technical proposal for a major weapon system, or (3) have actually used a MYP contract for subcontracted effort to a lower-tier subcontractor.

Multiyear Funding. A Congressional authorization and appropriation covering more than one fiscal year. The term should not be confused with two-year or three-year funds which cover only one fiscal year's requirement but permit the Executive Branch more than one year to obligate the funds.

Multiyear Procurement. A generic term describing situations in which the Government contracts, to some degree, for more than the current-year's requirement. Examples include multiyear contracts, block buys, and advance EOQ procurement. Generally, advance long-lead procurements in support of a single year's requirement would not be considered a multiyear procurement.

Non-recurring Costs. Those production costs which are generally incurred on a one-time basis including such costs as plant or equipment relocation, plant rearrangement, special tooling, special test equipment, preproduction engineering, initial spoilage and rework, and specialized work force training.

Recurring Costs. Production costs that vary with the quantity being produced, such as labor and materials.

Termination for Convenience. Procedure which may apply to any Government contract, including multiyear contracts. As contrasted with cancellation, termination can be effected at any time during the life of the contract (cancellation is commonly effected between fiscal years) and can be for the total quantity or a partial quantity (whereas cancellation must be for all subsequent fiscal year's quantities).

Termination Liability. The maximum cost the Government would incur if a contract is terminated. In the case of a multiyear contract terminated before completion of the current fiscal year's deliveries, termination liability would include an amount for both current-year termination charges and out-year cancellation charges.

Termination Liability Funding. Obligating sufficient contract funds to cover the contractor's expenditures plus termination liability, but not the total cost of the completed end items.

APPENDIX B

FIELD SURVEY INSTRUMENT

OMB # 0704-0070A
Expires 6/30/83

SECTION I

DEMOGRAPHICS

In this section you are asked to respond to questions concerning your background and experience.

1. Company Name:_____.

   Company Location:_____.

2. Your firm's industry can be best categorized as:
   (CIRCLE THE MOST CORRECT ANSWER)

   a. Electronics/Avionics
   b. Structural Components
   c. Engines and/or related components
   d. Subsystems
   e. Armament and/or related components
   f. Other, (please specify) _____.

3. Your firm's production activity can be best categorized as:
   (CIRCLE THE MOST CORRECT ANSWER)

   a. Fabrication
   b. Subassembly
   c. Final Assembly and Integration
   d. Other, (please specify) _____.

4. Your firm's primary product line can be best described as:
   (CIRCLE THE MOST CORRECT ANSWER)

   a. Tanks
   b. Ships
   c. Aircraft/Helicopters
   d. Missiles
   e. Munitions
   f. Radars/Guidance Systems
   g. Avionics
   h. Power Plant/Engines
   i. Structural Subassemblies
   j. General Electronics/ Instruments
   k. Landing Gears
   l. Support Systems
   m. Ground Support Equipment
   n. Other,_____ (please Specify)

OMB # 0704-0070A
Expires 6/30/83

5. Select the answer below that most nearly describes your area of responsibility within the firm.
(CIRCLE THE MOST CORRECT ANSWER)

a. Manufacturing/Operations Management
b. Financial Management
c. Contract Management
d. Subcontract Management/Materials Management
e. Marketing
f. Other, (please specify)_____.

6. Which choice below best describes your present position within the firm?
(CIRCLE THE MOST CORRECT ANSWER)

a. Executive Management
b. Middle Management
c. Foreman/Line Supervisor
d. Non Supervisory/Worker
e. Other, (please specify)_____.

7. How many years have you been in your present position (Identified in Question # 6)?
(CIRCLE THE MOST CORRECT ANSWER)

a. $<$ 1 Year
b. $\geq$ 1, But $<$ 3 Years
c. $\geq$ 3, But $<$ 5 Years
d. $\geq$ 5, But $<$ 7 Years
e. $\geq$ 7, But $<$ 10 Years
f. $\geq$ 10, But $<$ 15 Years
g. $\geq$ 15, But $<$ 25 Years
h. $\geq$ 25 Years

8. How many years have you been employed by your present firm?
(CIRCLE THE MOST CORRECT ANSWER)

a. $<$ 1 Year
b. $\geq$ 1, But $<$ 3 Years
c. $\geq$ 3, But $<$ 5 Years
d. $\geq$ 5, But $<$ 7 Years
e. $\geq$ 7, But $<$ 10 Years
f. $\geq$ 10, But $<$ 15 Years
g. $\geq$ 15, But $<$ 25 Years
h. $\geq$ 25 Years

OMB # 0704-0070A
Expires 6/30/83

9. How many years have you been employed in the defense industry?
(CIRCLE THE MOST CORRECT ANSWER)

a. ≤ 1 Year
b. ≥ 1, But < 3 Years
c. ≥ 3, But < 5 Years
d. ≥ 5, But < 7 Years
e. ≥ 7, But < 10 Years
f. ≥ 10, But < 15 Years
g. ≥ 15, But < 25 Years
h. ≥ 25 Years

10. Your firm's fiscal year runs from:
(CIRCLE THE MOST CORRECT ANSWER)

a. January to December
b. October to September
c. July to June
d. Other, (please specify)_____to _____.

11. The total dollar value of your firm's fiscal year 1982 sales was:
(CIRCLE THE MOST CORRECT ANSWER)

FOR YOUR ENTIRE COMPANY OR CORPORATION

a. ≤ $10 Million
b. ≥ $10, But < $25 Million
c. ≥ $25, But < $50 Million
d. ≥ $50, But < $100 Million
e. ≥ $100, But < $500 Million
f. ≥ $500 Million

FOR YOUR FACILITY OR PRODUCT DIVISION:

a. < $10 Million
b. ≥ $10, But < $25 Million
c. ≥ $25, But < $50 Million
d. ≥ $50, But < $100 Million
e. ≥ $100, But < $500 Million
f. ≥ $500 Million

OMB # 0704-0070A
Expires 6/30/83

12. The total dollar value of your firm's actual fiscal year 1981, 1982, and 1983 Government contracts, and proposed 1984 Government contracts was/is:
(PLACE AN X IN THE APPROPRIATE BOX FOR EACH YEAR)

FOR YOUR ENTIRE COMPANY OR CORPORATION

a. ≤ $5 Million
b. ≥ $5, But < $10 Million
c. ≥ $10, But < $25 Million
d. ≥ $25, But < $50 Million
e. ≥ $50, But < $100 Million
f. ≥ $100, But < $500 Million
g. ≥ $500 Million

	FISCAL YEAR			
	81	82	83	84
a.				
b.				
c.				
d.				
e.				
f.				
g.				

FOR YOUR FACILITY OR PRODUCT DIVISION:

a. ≤ $5 Million
b. ≥ $5, But < $10 Million
c. ≥ $10, But < $25 Million
d. ≥ $25, But < $50 Million
e. ≥ $50, But < $100 Million
f. ≥ $100, But < $500 Million
g. ≥ $500 Million

	FISCAL YEAR			
	81	82	83	84
a.				
b.				
c.				
d.				
e.				
f.				
g.				

13. The average direct labor to capital mix for your facility or product division in your fiscal year 1982 was:

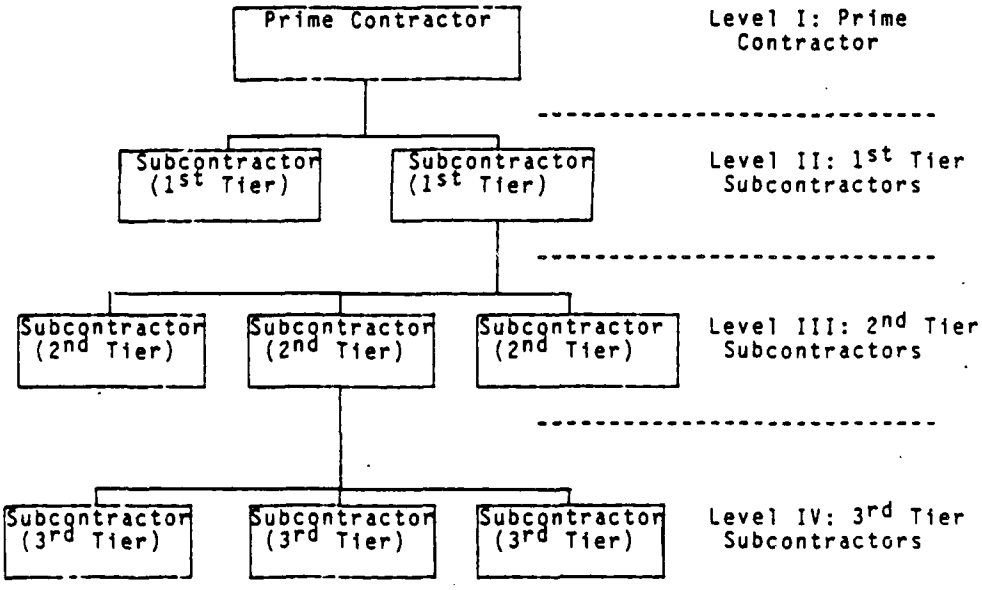
Use Formula: $\frac{\text{Direct Labor \$}}{\text{Capital Investment \$}}$

(CIRCLE THE MOST CORRECT ANSWER)

a. ≤ 20%
b. ≥ 20%, But < 40%
c. ≥ 40%, But < 60%
d. ≥ 60%, But < 80%
e. ≥ 80%, But < 100%
f. ≥ 100%

OMB # 0704-0070A
Expires 6/30/83

THE RELATIONSHIP BETWEEN CONTRACTORS AND SUBCONTRACTORS CAN BE DEPICTED AS FOLLOWS:



14. The percentage of your facility's or product division's fiscal year 1982 sales conducted within each of the above contractor-subcontractor relationship levels was:
(ENTER THE PERCENTAGE ASSOCIATED WITH EACH LEVEL)

a. _____ % Level I: As a Prime Contractor
b. _____ % Level II: As a 1st Tier Subcontractor
c. _____ % Level III: As a 2nd Tier Subcontractor
d. _____ % Level IV: As a 3rd Tier or lower Subcontractor
100 %

OMB # 0704-0070A
Expires 6/30/83

SECTION II

MYP SELECTION CRITERIA DESCRIPTION

1. Has your firm ever participated in a multiyear procurement (MYP) contract?

a. Yes
b. No

2. Have you or your firm ever participated in the development of a MYP cost or technical proposal?

a. Yes
b. No

3. Has your firm ever subcontracted out to lower-tier subcontractors using a MYP subcontract?

a. Yes
b. No

IF THE ANSWER TO 1, 2, OR 3 IS YES, CONTINUE COMPLETING SECTION II AND THEN TURN TO SECTION III.

IF THE ANSWERS TO 1, 2, AND 3 ARE NO, TURN TO SECTION III (SUGGESTED MYP CRITERIA) AND FINISH COMPLETING THE SURVEY.

4. As of 1 June 1983, what percentage of your firm's total sales dollars is presently under a MYP contractual effort? (CIRCLE THE MOST CORRECT ANSWER)

a. $\leq$ 1%
b. $\geq$ 1%, But $<$ 10%
c. $\geq$ 10%, But $<$ 20%
d. $\geq$ 20%, But $<$ 30%
e. $\geq$ 30%, But $<$ 40%
f. $\geq$ 40%

OMB # 0704-0070A
Expires 6/30/83

5. As of 1 June 1983, what percentage of <u>your firm's</u> subcontracted effort is being subcontracted out using a MYP subcontract?
(CIRCLE THE MOST CORRECT ANSWER)

a. $< 1\%$
b. $\geq 1\%$, But $< 10\%$
c. $\geq 10\%$, But $< 20\%$
d. $\geq 20\%$, But $< 30\%$
e. $\geq 30\%$, But $< 40\%$
f. $\geq 40\%$

6. The dollar value of MYP contract effort that your firm has proposed beyond 1 June 1983 is:
(CIRCLE THE MOST CORRECT ANSWER)

a. $<$ \$1 Million
b. $\geq$ \$1 Million, But $<$ \$25 Million
c. $\geq$ \$25 Million, But $<$ \$50 Million
d. $\geq$ \$50 Million, But $<$ \$75 Million
e. $\geq$ \$75 Million

7. Based on the dollar value of proposed MYP effort identified in Question # 6, what percentage do you plan to subcontract out using a MYP subcontract?
(CIRCLE THE MOST CORRECT ANSWER)

a. $< 1\%$
b. $\geq 1\%$, But $< 10\%$
c. $\geq 10\%$, But $< 20\%$
d. $\geq 20\%$, But $< 30\%$
e. $\geq 30\%$, But $< 40\%$
f. $\geq 40\%$

QUESTIONS 8 THROUGH 16 DEAL WITH CONTRACT EFFORTS WHERE YOUR FIRM SUBCONTRACTED OUT TO LOWER-TIER SUBCONTRACTORS USING A MYP SUBCONTRACT. THESE QUESTIONS DEAL WITH <u>YOUR FIRM'S</u> ACTUAL SUBCONTRACTED OUT EFFORTS AS OF 1 JUNE 1983 <u>USING A MYP</u> SUBCONTRACT AND THE POTENTIAL MYP SUBCONTRACT EFFORTS WHICH ARE CONTEMPLATED IN YOUR FIRM'S PROPOSED EFFORTS BEYOND 1 JUNE 1983. EACH QUESTION CONTAINS TWO PARTS, ONE WHICH CONCERNS ACTUAL MYP SUBCONTRACT EFFORT AND THE SECOND DEALS WITH POTENTIAL MYP SUBCONTRACT EFFORT.

(If either section is not applicable, leave that section blank.)

8. The percentage distribution of the type of contract associated with actual/proposed efforts being subcontracted out using a MYP contract is:
(ENTER A PERCENTAGE FOR EACH ACTUAL AND PROPOSED BLOCK)

		ACTUAL (AS OF 1 JUNE)	PROPOSED (BEYOND 1 JUNE)
a.	Firm Fixed Price		
b.	Fixed Price Incentive		
c.	Other Fixed Price		
d.	Cost		
e.	Cost Plus Fixed Fee		
f.	Cost Plus Incentive		
g.	Other Cost Types		
	Total % of MYP Subcontracts	100%	100%

9. The competitive marketplace associated with the actual/proposed efforts being subcontracted out using a MYP contract is:
(ENTER A PERCENTAGE FOR EACH ACTUAL AND PROPOSED BLOCK)

		ACTUAL (AS OF 1 JUNE)	PROPOSED (BEYOND 1 JUNE)
a.	Competitive (2 or more Firms)		
b.	Sole Source (One Firm)		
c.	Follow-on Effort		
	Total % of MYP Subcontracts	100%	100%

10. The size of the actual/proposed MYP subcontractor based on average total annual sales is:
(ENTER A PERCENTAGE FOR EACH ACTUAL AND PROPOSED BLOCK)

		ACTUAL (AS OF 1 JUNE)	PROPOSED (BEYOND 1 JUNE)
a.	$\leq$ \$10 Million		
b.	$\geq$ \$10 Million, But $<$ \$30 Million		
c.	$\geq$ \$30 Million, But $<$ \$50 Million		
d.	$\geq$ \$50 Million, But $<$ \$70 Million		
e.	$\geq$ \$70 Million, But $<$ \$90 Million		
f.	$\geq$ \$90 Million, But $<$ \$110 Million		
g.	$\geq$ \$110 Million		
	Total % of MYP Subcontracts	100%	100%

11. The complexity of the actual/proposed efforts being subcontracted out using a MYP subcontract, measured by % stable completion of hardware design, is identified as:
(ENTER A PERCENTAGE FOR EACH ACTUAL AND PROPOSED BLOCK)

		ACTUAL (AS OF 1 JUNE)	PROPOSED (BEYOND 1 JUNE)
a.	Hardware 100% Designed		
b.	Hardware 80% Designed		
c.	Hardware 60% Designed		
d.	Hardware 40% Designed		
e.	Hardware 20% Designed		
	Total % of MYP Subcontracts	100%	100%

12. The actual/proposed contracts for effort being sub-contracted out using a MYP subcontract are associated with the following production lot buys:
(ENTER A PERCENTAGE FOR EACH ACTUAL AND PROPOSED BLOCK)

		ACTUAL (AS OF 1 JUNE)	PROPOSED (BEYOND 1 JUNE)
a.	First Production Lot		
b.	Second Production Lot		
c.	Third or Subsequent Lots		
	Total % of MYP Subcontracts	100%	100%

13. The industries associated with the actual/proposed effort subcontracted out using a MYP subcontract are:
(ENTER A PERCENTAGE FOR EACH ACTUAL AND PROPOSED BLOCK)

		ACTUAL (AS OF 1 JUNE)	PROPOSED (BEYOND 1 JUNE)
a.	Electronics/Avionics		
b.	Raw Materials		
c.	Structural Subassemblies		
d.	Power Plant/Engines		
e.	Landing Gears		
f.	Support Systems		
g.	Radars/Guidance Systems		
h.	Other (please specify)		
	Total % of MYP Subcontracts	100%	100%

OMB # 0704-0070A
Expires 6/30/83

14. A percentage distribution of the size of the subcontract associated with the actual/proposed effort being subcontracted out using a MYP subcontract is:
(ENTER A PERCENTAGE FOR EACH ACTUAL AND PROPOSED BLOCK)

		ACTUAL (AS OF 1 JUNE)	PROPOSED (BEYOND 1 JUNE)
a.	≤ $10 Million		
b.	≥ $10 Million, But < $30 Million		
c.	≥ $30 Million, But < $50 Million		
d.	≥ $50 Million, But < $70 Million		
e.	≥ $70 Million, But < $90 Million		
f.	≥ $90 Million, But < $110 Million		
g.	≥ $110 Million		
	Total % of MYP Subcontracts	100%	100%

15. A percentage distribution of the length of the actual/proposed effort being subcontracted out using a MYP subcontract is:
(ENTER A PERCENTAGE FOR EACH ACTUAL AND PROPOSED BLOCK)

		ACTUAL (AS OF 1 JUNE)	PROPOSED (BEYOND 1 JUNE)
a.	≤ 1 Year		
b.	≥ 1, But ≤ 3 Years		
c.	≥ 3, But ≤ 5 Years		
d.	≥ 5 Years		
	Total % of MYP Subcontracts	100%	100%

OMB # 0704-0070A
Expires 6/30/83

16. The average industry experience level among all the actual/proposed MYP subcontractors identified in Question 13 is:
(ENTER A PERCENTAGE FOR EACH ACTUAL AND PROPOSED BLOCK)

		ACTUAL (AS OF 1 JUNE)	PROPOSED (BEYOND 1 JUNE)
a.	< 1 Year		
b.	≥ 1, But < 5 Years		
c.	≥ 5, But < 10 Years		
d.	≥ 10, But < 15 Years		
e.	≥ 15, But < 20 Years		
f.	≥ 20, But < 25 Years		
g.	≥ 25 Years		
	Total % of MYP Subcontracts	100%	100%

OMB # 0704-0070A
Expires 6/30/83

QUESTION 17 IS CONCERNED WITH THE CRITERIA THAT YOUR FIRM ACTUALLY USED TO EVALUATE POTENTIAL MYP SUBCONTRACTORS. EACH POTENTIAL CRITERION SHOULD BE RATED FROM 1 to 7 DEPENDING UPON THE DEGREE OF EMPHASIS ACTUALLY PLACED ON THE POTENTIAL EVALUATION CRITERION. THE FOLLOWING MEASUREMENT SCALE IS APPROPRIATE FOR QUESTION 17.

1 - Not A Consideration At All
2 - Very Weak Consideration
3 - Weak Consideration
4 - Considered
5 - Strong Consideration
6 - Very Strong Consideration
7 - Mandatory Consideration

17. What degree of consideration was given to the following subject areas when the decision was made to use a MYP subcontract for the MYP effort as of 1 June 1983 and the proposed effort beyond 1 June 1983 contemplating sub-contracted effort using a MYP subcontract.

(CIRCLE THE APPROPRIATE CONSIDERATION GIVEN)

CONSIDERATION

	NONE	VERY WEAK	WEAK	CONSIDERED	STRONG	VERY STRONG	MANDATORY
	1	2	3	4	5	6	7
a. Must be in Support of an Ongoing MYP Contract	1	2	3	4	5	6	7
b. Advance Government Funding	1	2	3	4	5	6	7
c. Economic Order Quantity Application	1	2	3	4	5	6	7
d. Past Performance of Subcontractor	1	2	3	4	5	6	7
e. Amount of Cost Savings Expected	1	2	3	4	5	6	7
f. Potential for Advance Buys	1	2	3	4	5	6	7
g. Number of Potential Competitors	1	2	3	4	5	6	7
h. Subcontractor's Production Capacity	1	2	3	4	5	6	7
i. Shelf Life of the Subcontracted Item	1	2	3	4	5	6	7
j. Amount of Termination Liability Your Firm Must Assume	1	2	3	4	5	6	7

OMB # 0704-0070A
Expires 6/30/83

1 - Not A Consideration At All
2 - Very Weak Consideration
3 - Weak Consideration
4 - Considered
5 - Strong Consideration
6 - Very Strong Consideration
7 - Mandatory Consideration

(CIRCLE THE APPROPRIATE CONSIDERATION GIVEN)

CONSIDERATION

	NONE	VERY WEAK	WEAK	CONSIDERED	STRONG	VERY STRONG	MANDATORY
	1	2	3	4	5	6	7
k. Your Firm's Storage Capacity	1	2	3	4	5	6	7
l. Production Quantities are Stable	1	2	3	4	5	6	7
m. Degree of Funding Stability	1	2	3	4	5	6	7
n. Degree of Configuration Stability	1	2	3	4	5	6	7
o. Dollar Size of Subcontract Effort	1	2	3	4	5	6	7
p. Funding Needs of the Subcontractor	1	2	3	4	5	6	7
q. Length of the Subcontract Effort	1	2	3	4	5	6	7
r. Complexity of Technology	1	2	3	4	5	6	7
s. Availability of Multiyear Funding	1	2	3	4	5	6	7
t. Experience Level of Subcontractor	1	2	3	4	5	6	7
u. Industry Product Line of Subcontract Effort	1	2	3	4	5	6	7
v. Capital Investment Commitments by Subcontractors	1	2	3	4	5	6	7
w. The Number of Shipsets per Production Lot	1	2	3	4	5	6	7
x. Others, (please specify) _____	1	2	3	4	5	6	7
_____	1	2	3	4	5	6	7

OMB # 0704-0070A
Expires 6/30/83

SECTION III

SUGGESTED MYP CRITERIA

IN THIS SECTION YOU ARE ASKED TO EXPRESS WHAT YOU FEEL SHOULD BE USED WHEN MAKING A DECISION TO USE A MYP CONTRACT FOR SUBCONTRACTED EFFORT. THE FOLLOWING QUESTIONS ARE TO BE ANSWERED ON A SEVEN-POINT SCALE.

1 - Not A Consideration At All
2 - Very Weak Consideration
3 - Weak Consideration
4 - Considered
5 - Strong Consideration
6 - Very Strong Consideration
7 - Mandatory Consideration

(CIRCLE THE APPROPRIATE CONSIDERATION THAT SHOULD BE GIVEN)

CONSIDERATION

	NONE	VERY WEAK	WEAK	CONSIDERED	STRONG	VERY STRONG	MANDATORY
	1	2	3	4	5	6	7

a.	Must be in Support of an Ongoing MYP Contract	1	2	3	4	5	6	7
b.	Advance Government Funding	1	2	3	4	5	6	7
c.	Economic Order Quantity Application	1	2	3	4	5	6	7
d.	Past Performance of Subcontractor	1	2	3	4	5	6	7
e.	Amount of Cost Savings Expected	1	2	3	4	5	6	7
f.	Potential for Advance Buys	1	2	3	4	5	6	7
g.	Number of Potential Competitors	1	2	3	4	5	6	7
h.	Subcontractor's Production Capacity	1	2	3	4	5	6	7
i.	Shelf Life of the Subcontracted Item	1	2	3	4	5	6	7
j.	Amount of Termination Liability Your Firm Must Assume	1	2	3	4	5	6	7

OMB # 0704-0070A
Expires 6/30/83

1 - Not A Consideration At All
2 - Very Weak Consideration
3 - Weak Consideration
4 - Considered
5 - Strong Consideration
6 - Very Strong Consideration
7 - Mandatory Consideration

(CIRCLE THE APPROPRIATE CONSIDERATION THAT SHOULD BE GIVEN)

CONSIDERATION

	NONE	VERY WEAK	WEAK	CONSIDERED	STRONG	VERY STRONG	MANDATORY
	1	2	3	4	5	6	7
k. Your Firm's Storage Capacity	1	2	3	4	5	6	7
l. Production Quantities are Stable	1	2	3	4	5	6	7
m. Degree of Funding Stability	1	2	3	4	5	6	7
n. Degree of Configuration Stability	1	2	3	4	5	6	7
o. Dollar Size of Subcontract Effort	1	2	3	4	5	6	7
p. Funding Needs of the Subcontractor	1	2	3	4	5	6	7
q. Length of the Subcontract Effort	1	2	3	4	5	6	7
r. Complexity of Technology	1	2	3	4	5	6	7
s. Availability of Multiyear Funding	1	2	3	4	5	6	7
t. Experience Level of Subcontractor	1	2	3	4	5	6	7
u. Industry Product Line of Subcontract Effort	1	2	3	4	5	6	7
v. Capital Investment Commitments by Subcontractors	1	2	3	4	5	6	7
w. The Number of Shipsets per Production Lot	1	2	3	4	5	6	7
x. Others, (please specify) _____	1	2	3	4	5	6	7
_____	1	2	3	4	5	6	7

OMB # 0704-0070A
Expires 6/30/83

OTHER COMMENTS ON FUTURE USE OF
MYP AT THE SUBCONTRACTOR LEVEL

APPENDIX C

MYP SELECTION CRITERIA

DEFINITIONS

A. Must be in Support of an Ongoing MYP Contract. Support of an ongoing MYP contract requires the subcontracted item to be a component of a program which is contractually bound using a MYP prime contract.

B. Advance Government Funding. Advance Government funding is a commitment by the Government to provide sufficient funds to cover the purchase of material to support long-lead acquisitions. Advance funding is usually provided at the beginning of a program to insure needed materials are available in sufficient time to meet production requirements (2:23).

C. Economic Order Quantity (EOQ) Application. The application of EOQ requires the subcontracted item to have the capability of being produced in economical lots, and a need must exist for the economic order quantity.

D. Past Performance of Subcontractor. The past performance of the subcontractor is concerned with the subcontractor's performance on previous contracts.

E. Amount of Cost Savings Expected. The amount of cost savings expected on the MYP contract deals with the percentage of savings anticipated when using a MYP subcontract as compared to the cost of a single-year subcontract.

F. Potential for Advance Buys. A subcontracted item has the potential for advance buys if the item has a known requirement, has a stable design, and requires early commitment to meet delivery schedule requirements.

G. Number of Potential Competitors. The number of potential competitors for a particular subcontract deals with the number of subcontractors expected to bid on a particular MYP subcontract.

H. Subcontractor's Production Capacity. The subcontractor's production capacity refers to the ability of the subcontractor to meet the increased production quantity requirements created by a multiyear contract.

I. Shelf Life of Subcontracted Item. The shelf life of the subcontracted item refers to the period of time the item can remain in storage and still remain suitable for use. Frequently, the subcontracted item requires special storage requirements which prevent the item from being economically purchased in advance of the time the item is needed (2:624).

J. Amount of Termination Liability Your Firm Must Assume. The amount of MYP termination liability a firm must assume depends on the contractual relationship between the contractor and subcontractors and the amount of termination liability that the Government is willing to

cover. By assuming a specified termination liability, the contractor agrees to reimburse the subcontractor for costs incurred within the specified limit if the program is cancelled.

K. Your Firm's Storage Capacity. A firm's storage capacity pertains to the ability to store items or subassemblies acquired using a MYP subcontract in advance of the time the end items or subassemblies are actually needed.

L. Production Quantities are Stable. The stability of production quantities deals with the establishment of known weapon system requirements where the number of units is firmly established.

M. Degree of Funding Stability. The degree of funding stability concerns any potential funding changes which could occur in the funding profile for a particular program, which may cause a change in the funding for the MYP subcontract.

N. Degree of Configuration Stability. Configuration stability is measured by the quantity of future design changes anticipated for the subcontracted item.

O. Dollar Size of Subcontract Effort. The dollar size of the subcontract effort refers to the total size of the MYP subcontract measured in current year dollars.

P. Funding Needs of the Subcontractor. The funding needs of the subcontractor include the methods of financing required by the subcontractor (e.g., progress payments, guaranteed loans, etc.).

Q. Length of the Subcontract Effort. The length of the subcontract effort includes the total number of years associated with the MYP subcontract.

R. Complexity of Technology. The technological complexity of the subcontracted item relates to the degree of technical sophistication of the subcontracted item.

S. Availability of Multiyear Funding. Availability of multiyear funding deals with the ability of the contractor to secure multiyear funds from the Government which can be passed on to the MYP subcontractor.

T. Experience Level of Subcontractor. The experience level of the subcontractor relates to the number of years the subcontractor has been operating within the defense industry.

U. Industry Product Line of Subcontract Effort. The industry product line for the subcontract concerns the particular industry (e.g., electronics, aerospace, engines, etc.) associated with the subcontracted effort.

V. Capital Investment Commitments by Subcontractors. The capital investment commitments by subcontractors refer to the commitment by a subcontractor to invest in capital equipment or facilities based on the award of the MYP subcontract.

W. The Number of Shipsets per Production Lot. The number of shipsets per production lot relates to the quantity of subcontract items per production lot, which are being purchased as part of the MYP subcontract.

APPENDIX D

RESPONDING DEFENSE CONTRACTORS

CORPORATION	DIVISION	DIVISION LOCATION
Aero Engineering and Manufacturing Company of California		Glendale, CA
Aerojet-General Corporation	Aerojet Ordnance Company	Downey, CA
Aerojet-General Corporation	Aerojet Tactical Systems	Sacramento, CA
Allied Aerospace Sector		Arlington, VA
AVCO Corporation	Lycoming Division	Stratford, CT
AVCO Corporation	Systems Division	Wilmington, MA
Bell Aerospace Textron	Dalmo Victor Operations	Belmont, CA
Bell Helicopter Textron, Inc.		Ft. Worth, TX
Bendix Corporation	Avionics Division	Ft. Lauderdale, FL
Bendix Corporation	Bendix Aerospace Group	Arlington, VA
Boeing Company	Boeing Aerospace Company	Seattle, WA
Boeing Company	Boeing Military Airplane Company	Wichita, KS
Chromalloy American Corporation	Chromalloy-Turbine Support	San Antonio, TX
Cleveland Pneumatic Company		Cleveland, OH
Curtiss-Wright Flight Systems, Inc.		Fairfield, NJ

CORPORATION	DIVISION	DIVISION LOCATION
Digital Equipment Corporation		Northboro, MA
Eaton Corporation	AIL Corporation	Deer Park, NY
Electrospace Systems, Inc.		Richardson, TX
Emerson Electric Company		St. Louis, MO
E-Systems, Inc.	Communications Manufacturing Division	St. Petersburg, FL
E-Systems, Inc.	ECI Division	St. Petersburg, FL
Fairchild Industries	Communications and Electronics Company	Germantown, MD
Fairchild Industries	Fairchild Republic Corp.	Farmingdale, NY
Fairchild Industries	Space and Electronics Co.	Germantown, MD
Ford Motor Company	Ford Aerospace and Communications Corp.	Arlington, VA
Garrett Corporation	AIResearch Manufacturing Company	Torrance, CA
Garrett Corporation	Garrett Turbine Engine Co.	Phoenix, AZ
General Dynamics Corporation	Pomona Division	Pomona, CA

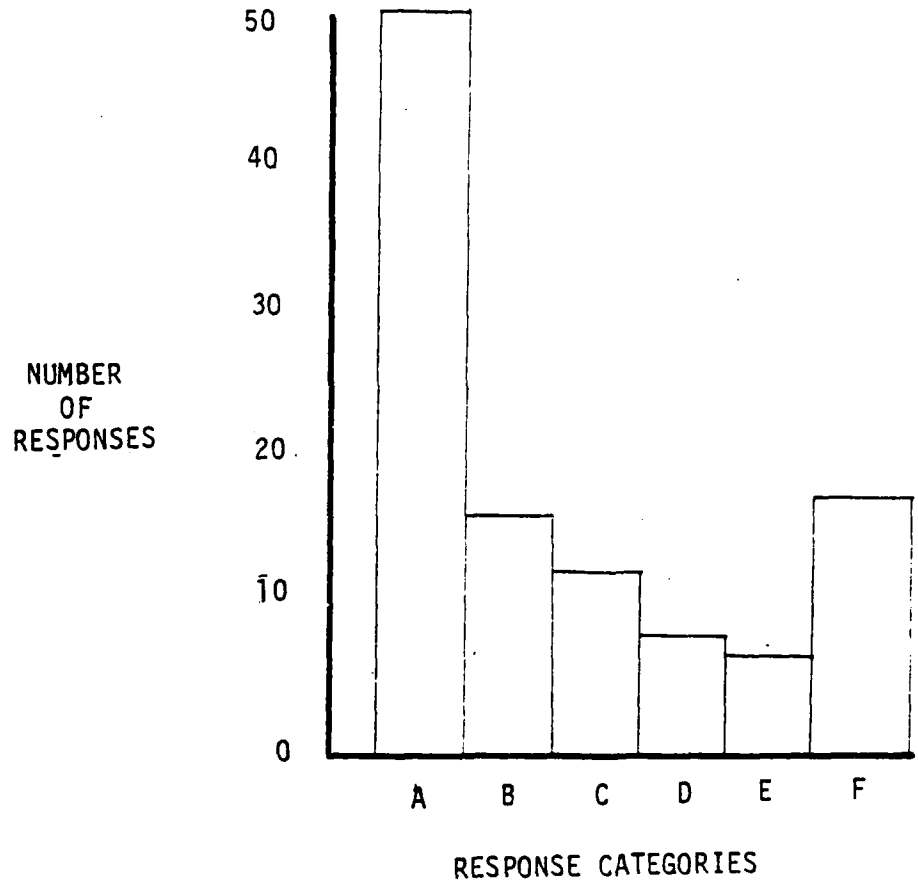
CORPORATION	DIVISION	DIVISION LOCATION
General Electric Company	Aircraft Engine Business Group	Cincinnati, OH
Goodyear Aerospace Corporation		Akron, OH
Grumman Corporation	Grumman Aerospace Corp.	Bethpage, NY
Hercules, Inc.	Aerospace Division	Bacchus, UT
Hobart Brothers Company	Power Systems Division	Troy, OH
Honeywell, Inc.	Aerospace and Defense Group	Minneapolis, MN
Hughes Aircraft Company	Missile Systems Group	Tucson, AZ
Hughes Aircraft Company	Radar Systems Group	El Segundo, CA
Hughes Helicopters, Inc.		Culver City, CA
IBM Corporation	Federal Systems Division	Bethesda, MD
Lear Siegler, Inc.	Astronics Division	Santa Monica, CA
Lear Siegler, Inc.	Power Equipment Division	Maple Heights, OH
Litton Industries	Litton Data Systems	Van Nuys, CA
Lockheed Corporation	Lockheed-Georgia Company	Marietta, GA

CORPORATION	DIVISION	DIVISION LOCATION
Loral Corporation	Loral Electronic Systems	Yonkers, NY
Martin-Marietta Aerospace	Aerospace Headquarters	Bethesda, MD
Metric Systems Corporation		Ft. Walton Beach, FL
Motorola, Inc.	Government Electronics Group	Scottsdale, AZ
Northrop Corporation	Aircraft Division	Hawthorne, CA
Raytheon Company		Lowell, MA
Simmonds Precision Products		Tarrytown, NY
Singer Company	Kearfott Division	Little Falls, NJ
Sperry Corporation	Defense Systems Division	St. Paul, MN
Sperry Corporation	Electronics Systems Division	Great Neck, NY
Sperry Corporation	Sperry Computer Systems	McLean, VA
Sundstrand Corporation	Aviation Operations	Rockford, IL
Teledyne CAE		Toledo, OH
Teledyne Ryan Aeronautical		San Diego, CA

CORPORATION	DIVISION	DIVISION LOCATION
Texas Instruments, Inc.		Dallas, TX
TRW, Inc.	Aircraft Components Group	Cleveland, OH
United Technologies Corporation	Pratt and Whitney Aircraft Group	East Hartford, CT
United Technologies Corporation	Sikorsky Aircraft Company	Stratford, CT
Varian Associates	Electron Device Group	Palo Alto, CA
Vought Corporation	Aerospace Division	Dallas, TX
Vought Corporation	Missiles and Advanced Program Division	Dallas, TX
Vought Corporation	Multiple Launch Rocket Systems Division	Dallas, TX
Westinghouse Electric Corporation		Baltimore, MD

APPENDIX E

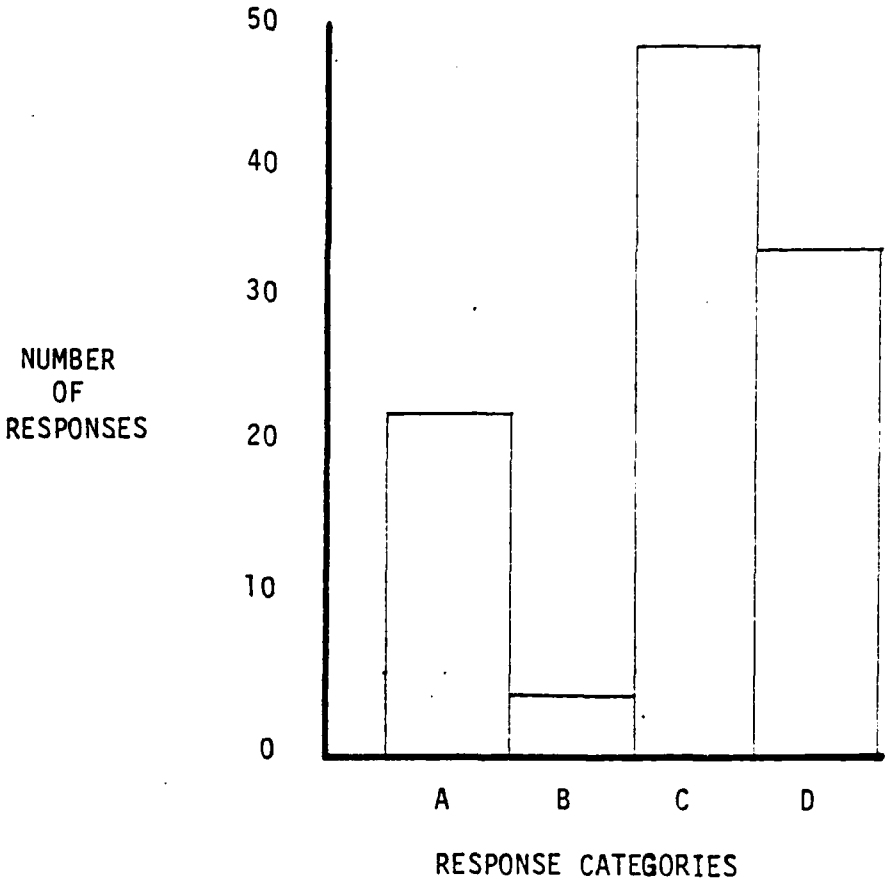
DEMOGRAPHICS ANALYSIS



RESPONSE CATEGORY	INDUSTRY	NUMBER OF RESPONSES	PERCENTAGE OF TOTAL
A	ELECTRONICS/AVIONICS	51	46.4%
B	STRUCTURAL COMPONENTS	15	13.6%
C	ENGINES AND/OR RELATED COMPONENTS	12	10.9%
D	SUBSYSTEMS	9	8.2%
E	ARMAMENT AND/OR RELATED COMPONENTS	7	6.4%
F	OTHER	16	14.5%

Figure 8

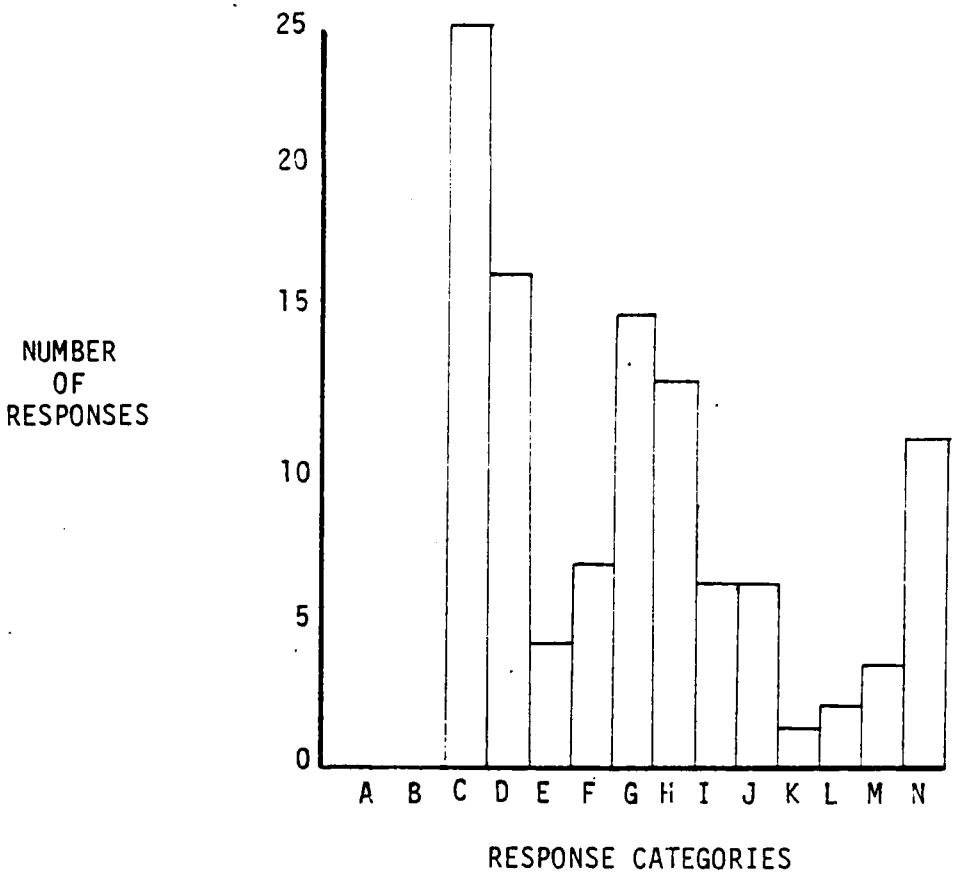
Defense Industry Structure for Responding Firms



RESPONSE CATEGORY	PRODUCTION ACTIVITY	NUMBER OF RESPONSES	PERCENTAGE OF TOTAL
A	FABRICATION	23	20.9%
B	SUBASSEMBLY	3	2.7%
C	FINAL ASSEMBLY AND INTEGRATION	49	44.6%
D	OTHER	35	31.8%

Figure 9

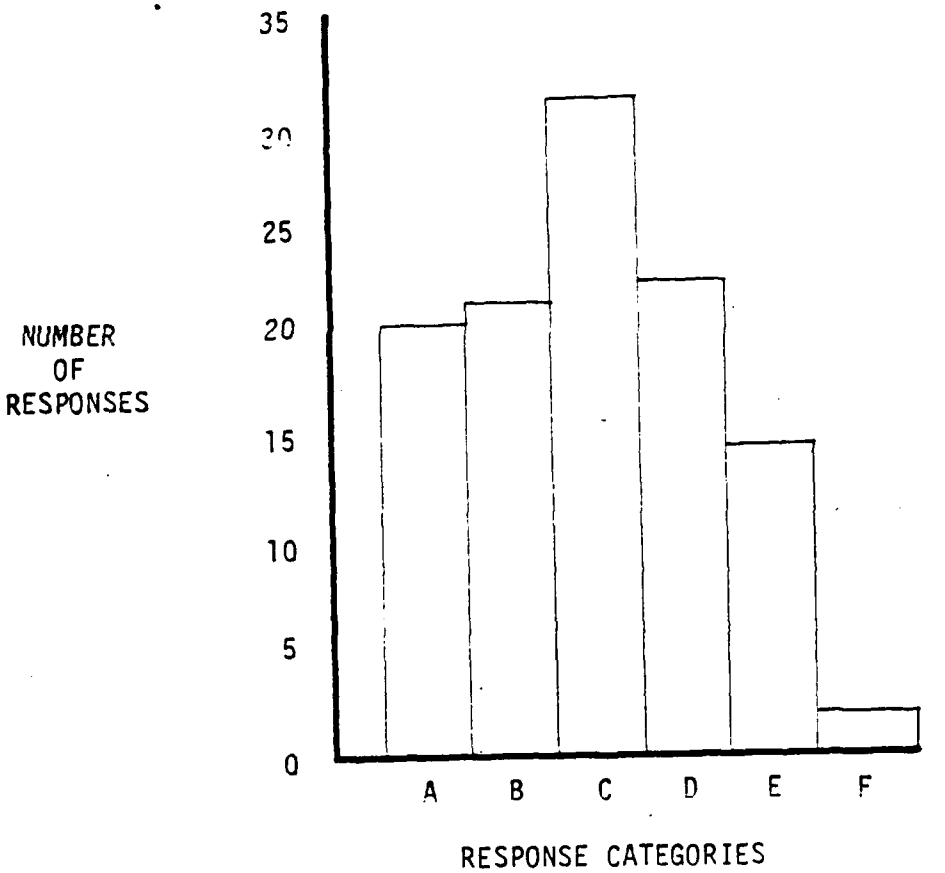
Primary Production Activity for Responding Firms



RESPONSE CATEGORY	PRODUCT LINE	NUMBER OF RESPONSES	PERCENTAGE OF TOTAL
A	TANKS	0	0.0%
B	SHIPS	0	0.0%
C	AIRCRAFT/HELICOPTERS	25	22.7%
D	MISSILES	17	15.5%
E	MUNITIONS	4	3.6%
F	RADARS/GUIDANCE SYSTEMS	7	6.4%
G	AVIONICS	15	13.6%
H	POWER PLANT/ENGINES	13	11.8%
I	STRUCTURAL SUBASSEMBLIES	6	5.5%
J	GENERAL ELECTRONICS/ INSTRUMENTS	6	5.5%
K	LANDING GEARS	1	.9%
L	SUPPORT SYSTEMS	2	1.8%
M	GROUND SUPPORT EQUIPMENT	3	2.7%
N	OTHER	11	10.0%

Figure 10

Primary Product Lines for Responding Firms



RESPONSE CATEGORY	FUNCTIONAL AREA	NUMBER OF RESPONSES	PERCENTAGE OF TOTAL
A	MANUFACTURING / OPERATIONS MANAGEMENT	20	18.2%
B	FINANCIAL MANAGEMENT	21	19.1%
C	CONTRACT MANAGEMENT	31	28.2%
D	SUBCONTRACT MANAGEMENT/ MATERIALS MANAGEMENT	22	20.0%
E	MARKETING	14	12.7%
F	OTHER	2	1.8%

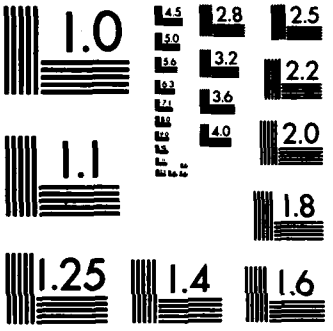
Figure 11

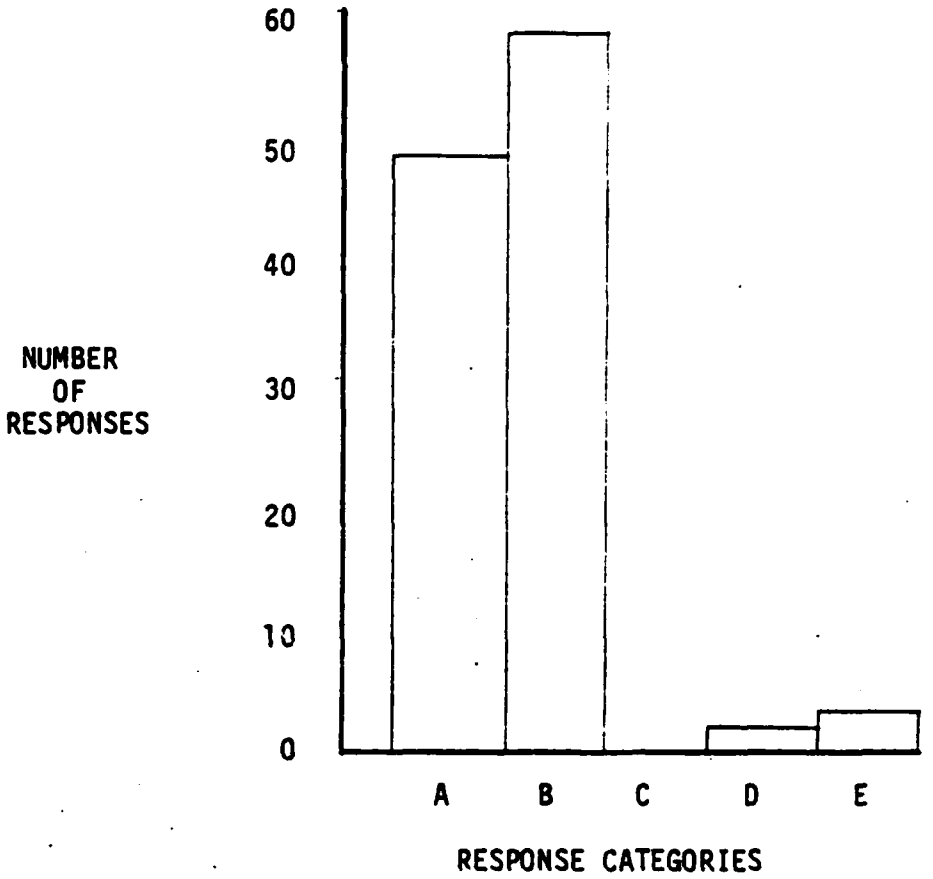
Functional Areas Represented by Respondents

AD-A135 638 MULTIYEAR SUBCONTRACTOR SELECTION CRITERIA ANALYSIS(U) 3/3
AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH SCHOOL
OF SYSTEMS AND LOGISTICS D L GRAY ET AL. SEP 83
UNCLASSIFIED AFIT-LSSR-106-83 F/G 5/1 NL

END

FILMED
1-84
DTIC

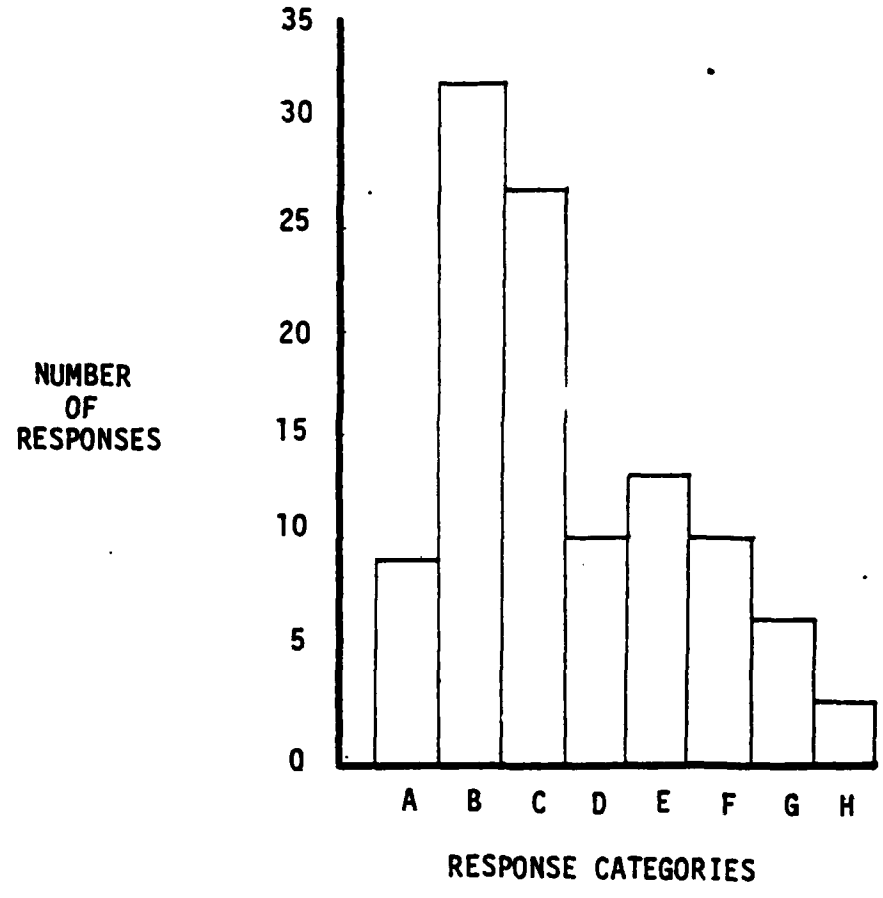




RESPONSE CATEGORY	PRESENT POSITION	NUMBER OF RESPONSES	PERCENTAGE OF TOTAL
A	EXECUTIVE MANAGEMENT	49	44.6%
B	MIDDLE MANAGEMENT	58	52.7%
C	FOREMAN/LINE SUPERVISOR	0	0.0%
D	NON SUPERVISORY/WORKER	1	.9%
E	OTHER	2	1.8%

Figure 12

Respondent's Present Position in Firm

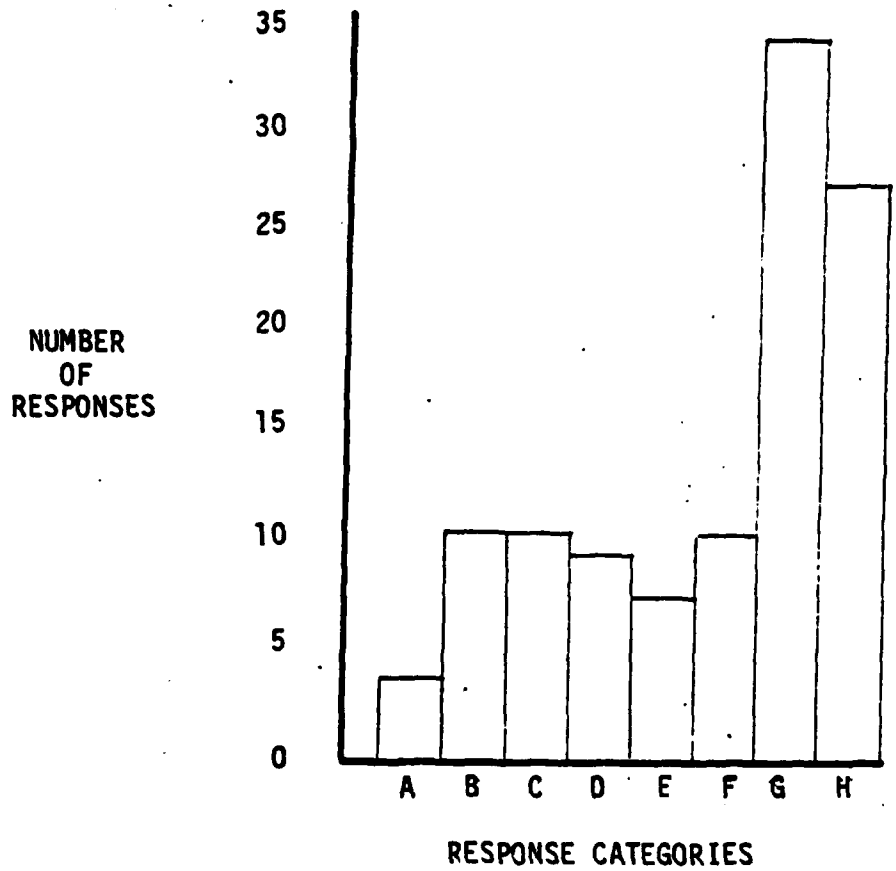


RESPONSE CATEGORY	YEARS IN PRESENT POSITION	NUMBER OF RESPONSES	PERCENTAGE OF TOTAL
A	$\lessgtr$ 1 YEAR	9	8.2%
B	$\geqslant$ 1 YEAR, BUT $\lessgtr$ 3 YEARS	32	29.1%
C	$\geqslant$ 3 YEARS, BUT $\lessgtr$ 5 YEARS	27	24.6%
D	$\geqslant$ 5 YEARS, BUT $\lessgtr$ 7 YEARS	10	9.1%
E	$\geqslant$ 7 YEARS, BUT $\lessgtr$ 10 YEARS	13	11.8%
F	$\geqslant$ 10 YEARS, BUT $\lessgtr$ 15 YEARS	10	9.1%
G	$\geqslant$ 15 YEARS, BUT $\lessgtr$ 25 YEARS	6	5.5%
H	$\geqslant$ 25 YEARS	3	2.6%

$\lessgtr$ = Less Than
$\geqslant$ = Greater Than or Equal to

Figure 13

Respondent's Years in Present Position With Firm

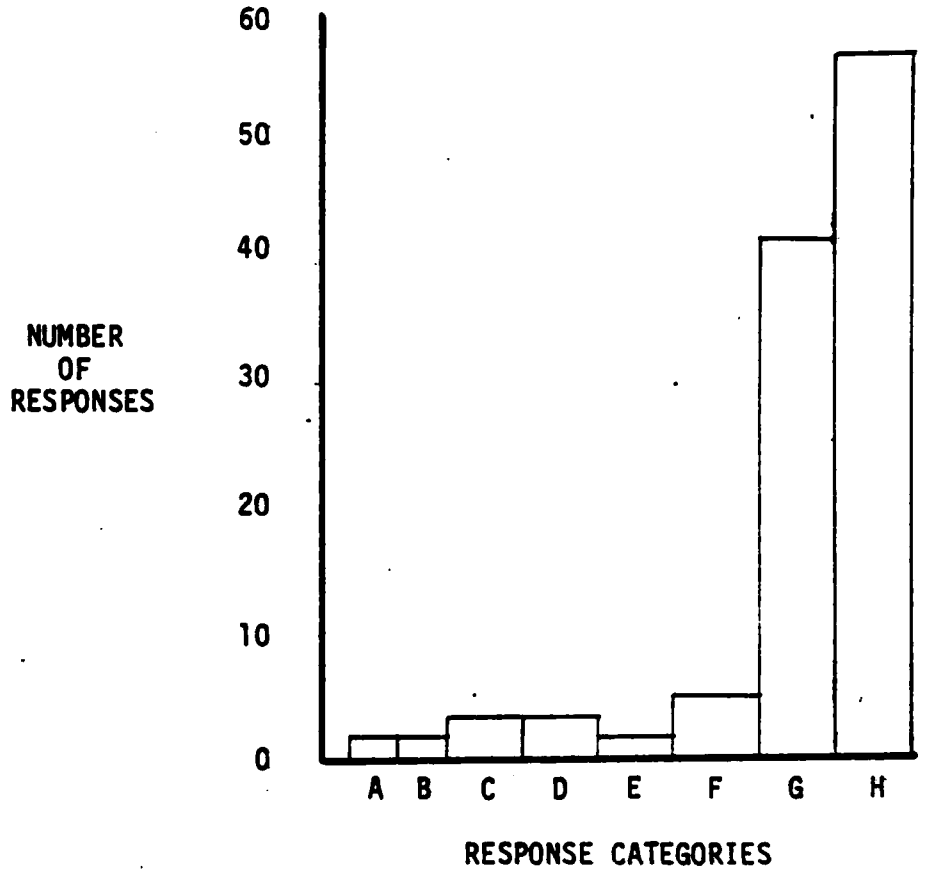


RESPONSE CATEGORY	YEARS WITH PRESENT FIRM	NUMBER OF RESPONSES	PERCENTAGE OF TOTAL
A	< 1 YEAR	3	2.7%
B	≥ 1 YEAR, BUT < 3 YEARS	10	9.1%
C	≥ 3 YEARS, BUT < 5 YEARS	10	9.1%
D	≥ 5 YEARS, BUT < 7 YEARS	9	8.2%
E	≥ 7 YEARS, BUT < 10 YEARS	7	6.4%
F	≥ 10 YEARS, BUT < 15 YEARS	10	9.1%
G	≥ 15 YEARS, BUT < 25 YEARS	34	30.8%
H	≥ 25 YEARS	27	24.6%

< = Less Than
≥ = Greater Than or Equal to

Figure 14

Respondent's Years With Present Firm

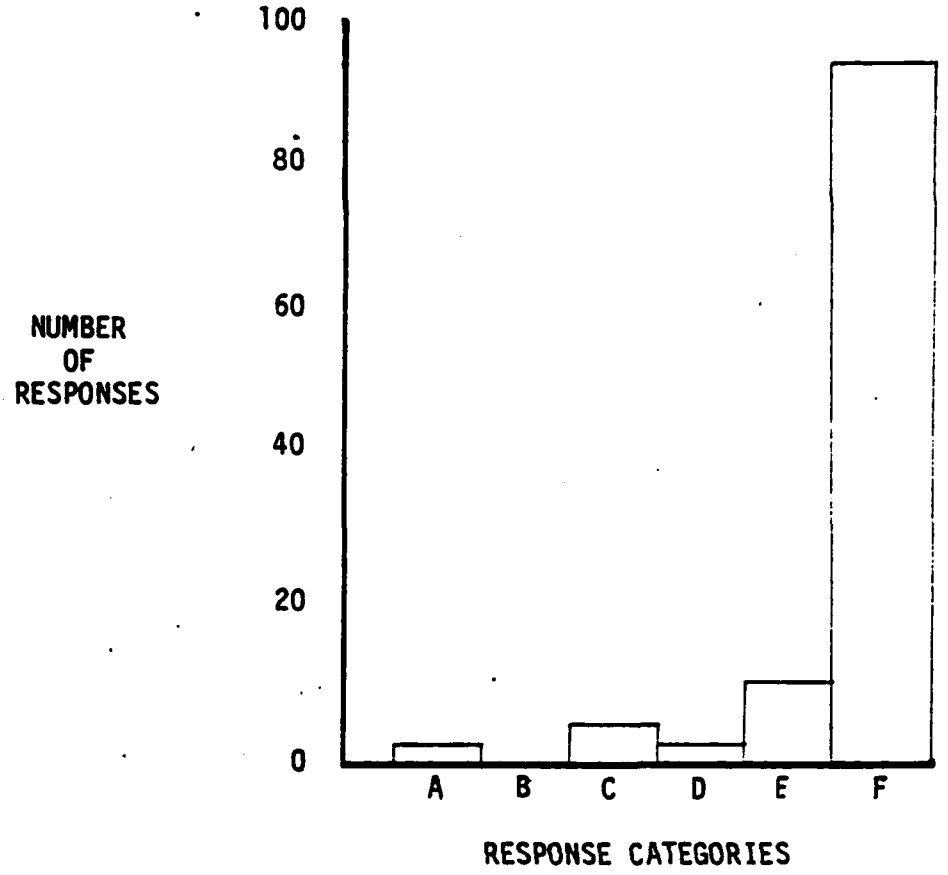


RESPONSE CATEGORY	YEARS IN DEFENSE INDUSTRY	NUMBER OF RESPONSES	PERCENTAGE OF TOTAL
A	< 1 YEAR	1	.9%
B	≥ 1 YEAR, BUT < 3 YEARS	1	.9%
C	≥ 3 YEARS, BUT < 5 YEARS	3	2.7%
D	≥ 5 YEARS, BUT < 7 YEARS	3	2.7%
E	≥ 7 YEARS, BUT < 10 YEARS	1	.9%
F	≥ 10 YEARS, BUT < 15 YEARS	4	3.7%
G	≥ 15 YEARS, BUT < 25 YEARS	41	37.3%
H	≥ 25 YEARS	56	50.9%

< = Less Than
≥ = Greater Than or Equal to

Figure 15

Years in the Defense Industry for Responding Firms

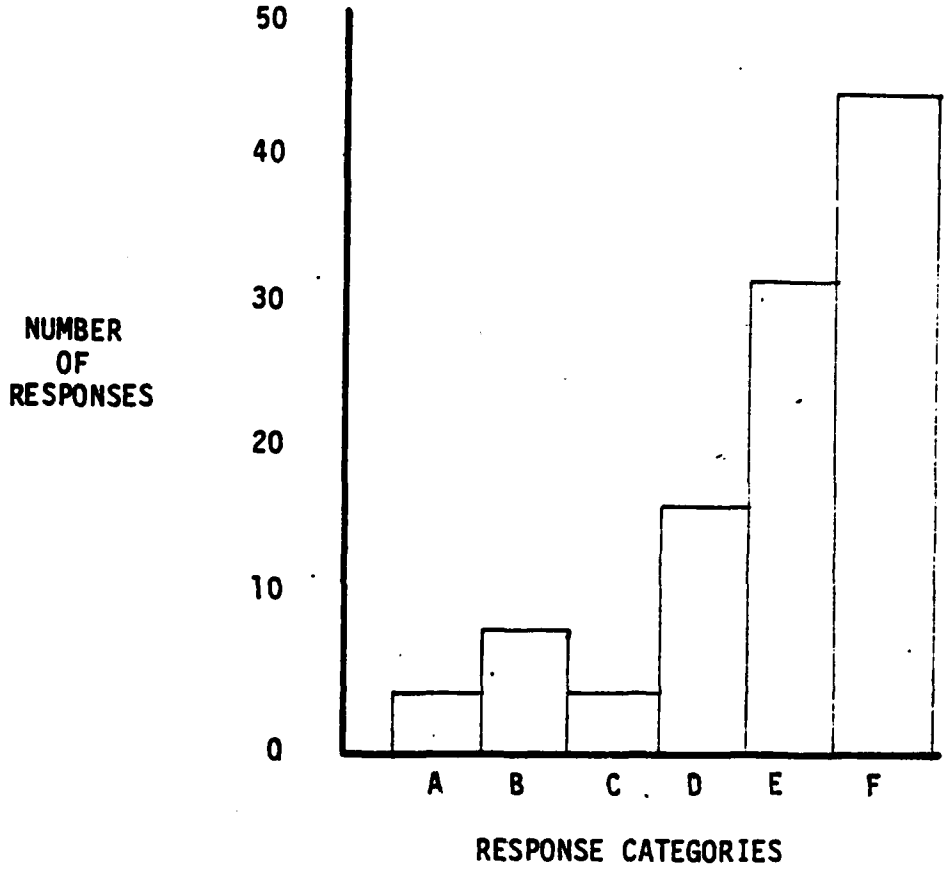


RESPONSE CATEGORY	FY82 CORPORATE SALES	NUMBER OF RESPONSES	PERCENTAGE OF TOTAL
A	≤ $10 MILLION	1	.9%
B	≥ $10 MILLION, BUT ≤ $25 MILLION	0	0.0%
C	≥ $25 MILLION, BUT ≤ $50 MILLION	3	2.8%
D	≥ $50 MILLION, BUT ≤ $100 MILLION	1	.9%
E	≥ $100 MILLION, BUT ≤ $500 MILLION	10	9.2%
F	≥ $500 MILLION	94	86.2%

FY = Fiscal Year
≤ = Less Than
≥ = Greater Than or Equal to

Figure 16

FY82 Corporate Sales for Responding Firms

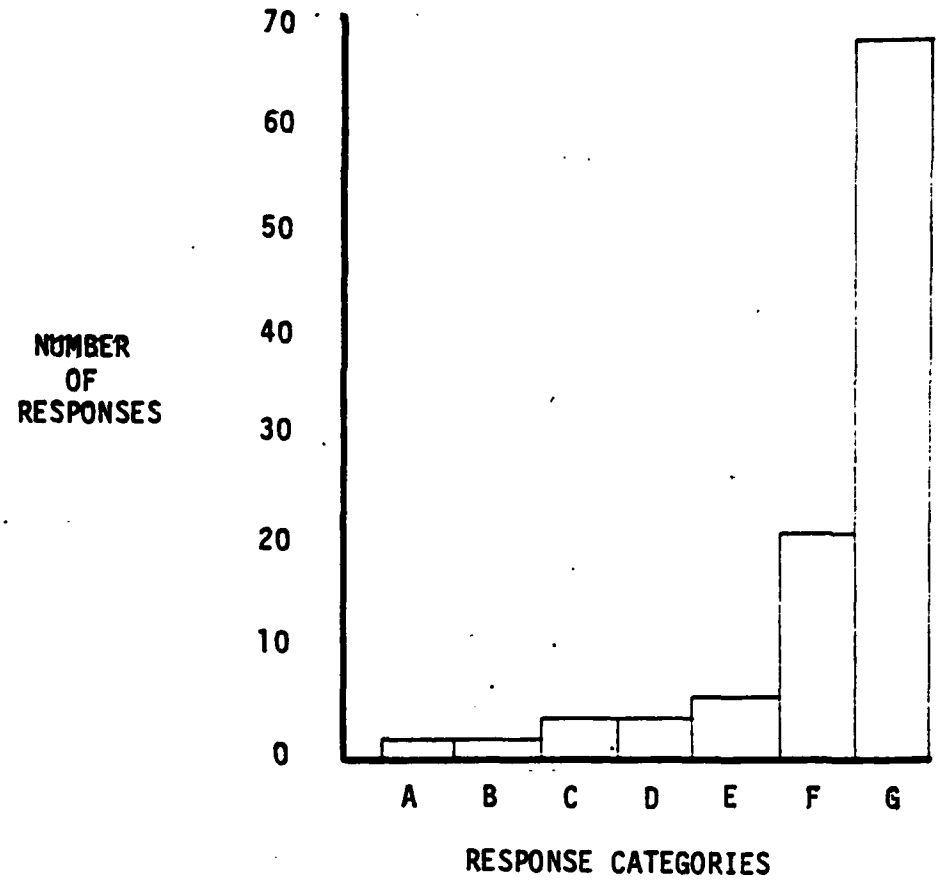


RESPONSE CATEGORY	FY82 PRODUCT DIVISION SALES	NUMBER OF RESPONSES	PERCENTAGE OF TOTAL
A	$\lessdot$ \$10 MILLION	3	2.8%
B	$\geq$ \$10 MILLION, BUT $\lessdot$ \$25 MILLION	8	7.5%
C	$\geq$ \$25 MILLION, BUT $\lessdot$ \$50 MILLION	3	2.8%
D	$\geq$ \$50 MILLION, BUT $\lessdot$ \$100 MILLION	16	15.0%
E	$\geq$ \$100 MILLION, BUT $\lessdot$ \$500 MILLION	32	29.9%
F	$\geq$ \$500 MILLION	45	42.0%

FY = Fiscal Year
$\lessdot$ = Less Than
$\geq$ = Greater Than or Equal to

Figure 17

FY82 Product Division Total Sales for Responding Firms

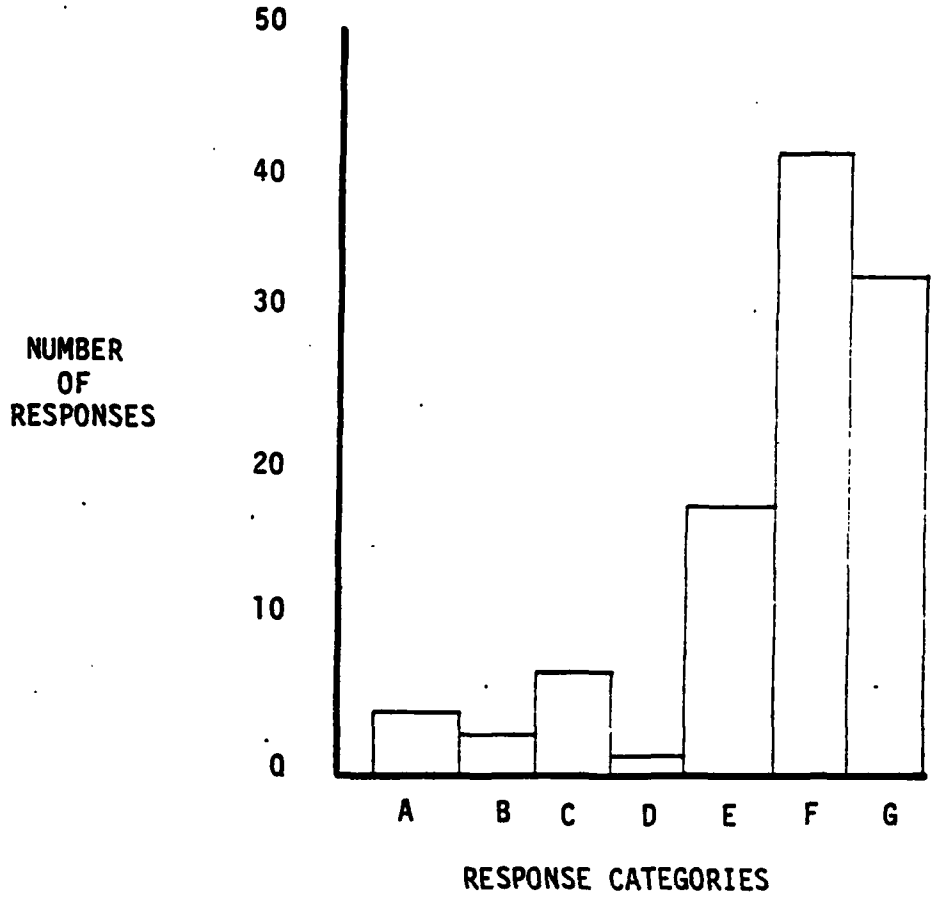


RESPONSE CATEGORY	CORPORATE FY82 GOVERNMENT SALES	NUMBER OF RESPONSES	PERCENTAGE OF TOTAL
A	$\lessapprox$ $5 MILLION	1	1.0%
B	$\gtrapprox$ $5 MILLION, BUT $\lessapprox$ $10 MILLION	1	1.0%
C	$\gtrapprox$ $10 MILLION, BUT $\lessapprox$ $25 MILLION	2	2.0%
D	$\gtrapprox$ $25 MILLION, BUT $\lessapprox$ $50 MILLION	2	2.0%
E	$\gtrapprox$ $50 MILLION, BUT $\lessapprox$ $100 MILLION	5	5.0%
F	$\gtrapprox$ $100 MILLION, BUT $\lessapprox$ $500 MILLION	21	20.8%
G	$\gtrapprox$ $500 MILLION	69	68.3%

FY = Fiscal Year
$\lessapprox$ = Less Than
$\gtrapprox$ = Greater Than

Figure 18

Corporate FY82 Government Sales for Responding Firms

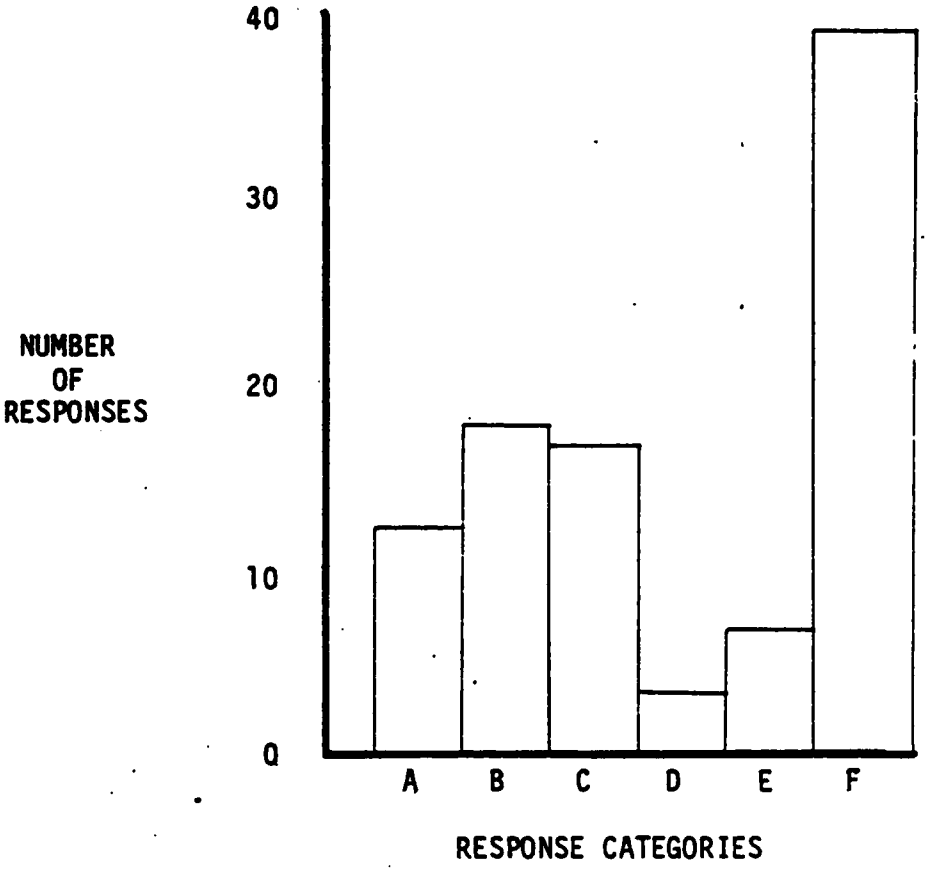


RESPONSE CATEGORY	PRODUCT DIVISION FY82 GOVERNMENT SALES	NUMBER OF RESPONSES	PERCENTAGE OF TOTAL
A	< $5 MILLION	4	3.8%
B	≥ $5 MILLION, BUT < $10 MILLION	2	1.9%
C	≥ $10 MILLION, BUT < $25 MILLION	7	6.6%
D	≥ $25 MILLION, BUT < $50 MILLION	1	1.0%
E	≥ $50 MILLION, BUT < $100 MILLION	17	16.0%
F	≥ $100 MILLION, BUT < $500 MILLION	42	39.6%
G	≥ $500 MILLION	33	31.1%

FY = Fiscal Year
< = Less Than
≥ = Greater Than or Equal to

Figure 19

Product Division FY82 Government Sales for Responding Firms



RESPONSE CATEGORY	DIRECT LABOR TO CAPITAL RATIO	NUMBER OF RESPONSES	PERCENTAGE OF TOTAL
A	< 20%	12	12.8%
B	≥ 20%, BUT < 40%	18	19.1%
C	≥ 40%, BUT < 60%	16	17.0%
D	≥ 60%, BUT < 80%	3	3.2%
E	≥ 80%, BUT < 100%	6	6.4%
F	≥ 100%	39	41.5%

< = Less Than
≥ = Greater Than or Equal to

Figure 20

Direct Labor to Capital Mix for Responding Firms

BIBLIOGRAPHY

REFERENCES CITED

1. Acker, David D., and Harold J. Schutt. "Pr[illegible]am Stability: An Essential Element in Impr[illegible]ed Acquisition," Concepts, Volume 5 (Summe[illegible]982), pp. 148-160.

2. Air Force Institute of Technology. Compendium of Authenticated Systems and Logistics Terms, Definitions and Acronyms. AU-AFIT-LS-3-82, Wright-Patterson AFB OH, March 1982.

3. Air Force Logistics Command. Compendium of Depot Maintenance Contractors. Wright-Patterson AFB OH, 1 September 1982.

4. Augustine, Norman. "Just How Good/Bad is the Defense Acquisition Process?," Government Executive, February 1982, pp. 27-34.

5. Becker, Richard A., and John M. Chambers. S A Language and System for Data Analysis. Bell Laboratories, January 1981.

6. Borklund, C. W. "Defense Planning-Budgeting-Acquisition: Why Strategy is Back Up Front," Government Executive, October 1981, pp. 17-26.

7. Brabson, Colonel G. Dana., and Abraham Singer. "Enhanced Multiyear Procurement for Improving Weapon Systems Acquisition," Concepts, Volume 5 (Summer 1982), pp. 112-129.

8. _____. "Department of Defense Acquisition Improvement Program," Concepts, Autumn 1981, pp. 54-75.

9. Brearey, Major Jonathan L., and Major Ronald H. Rasch. "Multiyear Procurement: A Current Perspective," Concepts, Volume 5 (Spring 1982), pp. 39-53.

10. _____. "An Analysis of the Impact of Multiyear Procurement on Weapon System Acquisition," Unpublished master's thesis. LSSR 62-81, AFIT/LS, Wright-Patterson AFB OH, September 1981. AD A107708.

11. Brechtel, Captain Donald L., USAF. "Design and Analysis of a Simulation Model of the Resource-Acquisition Process for Government Contractors." Unpublished doctoral dissertation. The Florida State University. August 1981.

12. Buzan, Barbara. World Aviation Directory. Ziff-Davis Publishing Company, 1983.

13. Carlucci, Frank C., Deputy Secretary of Defense. Memorandum for Secretaries of the Military Departments, The Pentagon, Washington DC, 30 April 1981.

14. _____, Deputy Secretary of Defense. Memorandum for Secretaries of the Military Departments, The Pentagon, Washington DC, 1 May 1981.

15. Directorate for Information, Operations, and Reports. Companies Participating in the Department of Defense Subcontracting Program First Quarter - Fiscal Year 1982. Washington: Government Printing Office, 1982.

16. Fromer, Harvey. Grumman Aerospace Corporation. Technical Marketing Society of America Conference, "Multiyear Contracting," Washington, 18-20 May 1982.

17. Gansler, Jacques S. The Defense Industry. Cambridge MA: MIT Press, 1980.

18. General Accounting Office. "DOD, GAO Analysis of Projects Proposed by the Department of Defense for Multiyear Contracting in its Fiscal Year 1983 Budget Request," Federal Contracts Report. Washington: Bureau of National Affairs, Inc., No. 206570, 29 April 1982.

19. Gordon, Raymond L. Unidimensional Scaling of Social Variables - Concepts and Procedures. New York: The Free Press, 1977.

31. Slay, General Alton D., USAF (Ret), "A New Look at an Old Remedy," Defense Management Journal, First Quarter 1982, pp. 20-25.

32. Springer, Robert M., Jr. "Multiyear Contracting, Time for Action," Contract Management, October 1981, pp. 9-10.

33. Sansone, J. S. Jr., Deputy Chief of Naval Material. "Multiyear Contracting Policy," Washington: Government Printing Office, 17 January 1983.

34. Thompson William E. III. "Risk Implications for Cost Growth in Weapon System Acquisition Programs," Concepts, Volume 5, (Spring 1982), pp. 116-128.

35. U.S. Congress. House of Representatives. Committee on Armed Services and the Panel of Defense Industrial Base. Capability of U.S. Defense Industrial Base. Report to Congress, 96th Congress, Second Session, 1980. Washington: Government Printing Office, 1980.

36. _____. Committee on Appropriations. Department of Defense Appropriation Bill 1983. Report to Congress, 97th Congress, Second Session, 1982. Washington: Government Printing Office, 1982.

37. U.S. Department of Defense. Defense Acquisition Regulation (DAR)/Armed Services Procurement Regulation Manual (ASPM). Washington: Government Printing Office, 1980.

38. Utgoff, Kathleen P., and Dick Thaler. "The Economies of Multiyear Contracting." Professional Paper 345. Center for Naval Analysis, Alexandria VA, March 1982.

39. Weigand, Commander Rudolph, Assistant Professor, Air Force Institute of Technology, AFIT/ENC, Wright-Patterson AFB OH. Personal interview. 20 July 1983.

40. Williams, James E., Jr. Deputy Assistant Secretary for Acquisition Management, Office of the Secretary of the Air Force, Washington. Telephone interview. 6 April 1983.

20. Hamburg, Morris. Statistical Analysis for Decision Making. New York: Harcourt, Brace, and World Inc., 1970.

21. Hull, C. Hadlai, and others. Statistical Package for the Social Sciences. New York: McGraw-Hill, 1975.

22. Knittle, Duane D., and Arthur J. Mandler. "Adapting to Multiyear Procurement." Unpublished research report APRO 81-10, Army Procurement Research Office, U.S. Army Material Systems Analysis Activity, Fort Lee VA, 1981.

23. Lafors, Colonel Kary R., USAF. "Selecting Programs for Multiyear Procurement," Concepts, Volume 5 (Spring 1982), pp. 54-67.

24. Logistics Management Institute. Multi-Year Procurement at the Subcontractor Level. Task 67-13, Washington, June 1967.

25. McClave, James T., and George Venson. Statistics for Business and Economics. Santa Clara: Dellen Publishing Company, 1982.

26. "Multiyear Views from Challenge 81," Contract Management, October 1981, pp. 14-15.

27. Neave, H. R. Statistics Tables. Boston: George Allen and Urwin, 1978.

28. Nunnally, Jim C. Psychometric Theory. New York: McGraw-Hill, 1978.

29. Perry, William J., Under Secretary of Defense for Research & Engineering. "The Department of Defense Statement on Industrial Readiness," presented to the Defense Industrial Base Panel of the Committee on Armed Services, United States House of Representatives, 96th Congress, Second Session, 3 December 1981.

30. Schemmer, Benjamin F. "Curing America's Strategy-Force Mismatch, Strategic Initiatives to Bridge a Budget Chasm too Big for Dollars Alone to Cure," Armed Forces Journal, March 1981, pp. 42-53.

END

FILMED

1-84

DTIC