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NAVAL WAR COLLEGE
Newport, R.I.

DEFENSE CONTRACTING POLICY: AN INTERFACE MECHANISM WITH THE DEFENSE INDUSTRY

by

George P. Neyman III

LCDR, USN

A Research Paper submitted to the Faculty of the Naval War College and the Graduate School of the University of Rhode Island in partial satisfaction of the requirements for the degree of Master of Marine Affairs.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

Signature: George P. Neyman III

19 June 1972

Research Paper directed by
Lewis M. Alexander, PH.D.

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Faculty Research Advisor Date

Abstract of

DEFENSE CONTRACTING POLICY: AN
INTERFACE MECHANISM WITH THE DEFENSE INDUSTRY

A broad overview of the contractual relationship between the military and the defense industry with emphasis on contracting trends and the impact of these trends on the nature of the defense industry, shipbuilding in particular. A brief historical survey of government contracting from the American Revolution to the present time is designed to review the principal legislative actions developed to control the procurement process. The advantages and disadvantages of the important contract types are discussed. From a profile of the defense industry developed from geographic, demographic, political, and national priority factors, the nature of the so termed military-industrial complex is examined and found to be real, necessary, but largely emotional when considered as a conspiracy against peace and society. Defense contracting policy is found to be shifting from cost reimbursement contract to the incentive contract. The trend to contract incentives is found to be an improvement over earlier policy but not without disadvantages. The influence of the procurement strategy used by the Department of Defense is examined through a summary of the attitudes of the major shipbuilding organization. The conclusion is reached that the total package procurement

strategy is not favored by shipyard management. Incentive clauses, with carefully designed provisions, structured into phased cost plus and fixed price contract types can serve to acquire ships at the lowest possible cost with a minimum of over-run.

PREFACE

Purpose. The goal of this paper is to examine the interface relationships between the Department of Defense (Navy) and the private shipbuilding community (Industry) for the purpose of expressing these relationships in the dynamic business atmosphere of this current day. This interface is largely defined by the contracting process and the development of contracting will be briefly traced to point up the trends which evolved into the complex contracting regulations which govern the defense-industrial team. The national, economic and political influences which exert pressure upon this interface will be commented on.

The Navy is under great pressure both from within and outside of the Department of Defense to meet the major threat of the Soviet fleet. In order to meet the threat, the Navy must effect a modernization program which includes men, material*, and methods. It can be considered that this modernization is mandatory if the United States is to continue the influence necessary to its national interests on the sealanes of the world.

To effect this material modernization, the Navy relies upon the industrial capability of the private shipbuilding

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*Within this paper, only the material aspect of the modernization mentioned here will be considered.

community. The link by which the Navy communicates with this community is the contract. The Navy essentially says what is wanted, when it is wanted, how good it should be, and how much the Navy is willing to pay for the ship or equipments through the medium of the contract. All these categories are under much critical examination as they relate to the specification of required characteristics, and the nature of the contract document is ever more important. It also, in these days of complicated and involved business proceedings, has taken on a complexity which is perhaps only exceeded by the amount of money involved in the transaction. The attitudes which are generated by this interface are of great interest and will be explored where data is available.

Sources. For the historical background review, several volumes were consulted which must be considered as secondary sources. For the technical data on contracting, contracting officer's guidebooks were consulted to form the basis for this discussion along with numerous detailed studies by experts of the Rand Corporation and several other institutions. No attempt was made to reduce the overwhelming volume of the Armed Services Procurement Regulations into a usable form. Primary sources, such as hearing transcripts, government publications, and news articles were used as much as possible. Much reduced data, presented in tabular form must be considered secondary in nature.

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CHAPTER I

INTRODUCTION

This is a paper about a mechanism and an interface. The mechanism is the process of contracting, the interface is the contact region between the military or if you prefer, the government, and the private business interests known more popularly as the defense contractors. The approach of the paper is more exploratory than expository, taking the shape of a study more than an innovative thesis.

There are a number of very influential people who are extremely interested in this interface. Certainly industrial leaders, presidents of corporations and chairmen-of-the board are interested. Military men and politicians are interested, but the new awareness of the citizenry has awakened the political sense of the legislative body regarding the military-industrial complex as never before. Some members of the Congress have long been voicing their concern but without great general impact. Senator William Proxmire has written:

> I believe that as citizens, as officials, as servicemen, as American taxpayers, we must look hard at all of the consequences of our uncritical attitude toward the Pentagon. We must examine in detail the over-runs, inefficiencies, and aborted weapons systems the military-industrial complex has spawned. We must calculate closely what the wastefulness and power of the Pentagon costs us.[1]

Senator Paul Douglas, who preceded Senator Proxmire as Chairman of the Joint Economic Committee was somewhat more specific as to blame when he commented: ". . . both the Congress and the Executive branch of the United States Government allowed the military to run wild without a challenge."[2] Whether one agrees with the viewpoints of these distinguished lawmakers or not, the fact must be faced that the public sector is now expressing a greater interest in the manner in which their monies have been, and are being, and will be spent by the Defense Department on their behalf. There is doubt that the public interest is indeed being served. Critical comment from various interest groups make the claim that the priorities of the Nation should be changed to look inward at problems, rather than outward to the problems of foreign relations and defense. This changing attitude has been officially recognized by the Department of Defense, and Defense Secretary Laird, in his statement to the House Armed Services Committee, took note of this fact:

> The shift in our priorities, away from defense and to civilian pursuits, has been massive. The size and price of this change is not generally appreciated.[3]

The Secretary, at a later point in his discussion points out his estimate of the relative size of this change:

> The change in the Fiscal Year 1968 to Fiscal Year 1972 period is especially significant. Defense spending drops by 23.9 billion dollars,* while other federal spending grows by 36.4 billion dollars. This means that two-thirds of the real increase in civilian spending can be viewed as having been financed by defense cutbacks. Civilian programs are increasing by 36.4 billion dollars while the federal budget total (in real terms) increases by about one-third of that amount.[4]

Thus, it would seem that these pressures have been reacted to and they have, however, one might have some difficulties with the arithmetic, the point to note is that generally, there will be less money with which to buy new weapon systems and more in the civilian sector.

These trends are, of course, motivated by many factors other than the high cost of defense and a simple causative formula does not exist, however, there is little doubt that the public sector will continue to exert pressure against the defense expenditure level. This pressure will continue until the public is satisfied that adequate measures are being taken to reduce spending to the lowest feasible level. More simply, the pressure will only be released when they are assured that the most effective use of the appropriations for defense purposes are being made. The arguments must be heard and positive actions taken in order to provide the necessary assurances.

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*The dollars to which the Secretary refers are 1972 valued dollars.

The complexities of the entire problem of spending money for defense purposes wisely and efficiently are mind boggling. The enormous size of the organization (3,587,000 people)[5] and the enormous budget *(78,743 million dollars)[6] compose a management problem with challenges of every conceivable type. Because of this complexity, only a small portion of the problem can be treated herein.

It is considered that the interface between the Defense establishment and the defense oriented industry is an area of fruitful concern. This interface is generally defined by the process of contracting and this is what will be explored. The author claims no expertise in this area, rather he stands in awe of the complex legalities and the language employed in such instruments. This is as much a vehicle for self-instruction as it is an attempt to strip some of these complexities away and expose what might be considered the essential elements of defining the contractual interface. The historical development of the procurement process will be briefly explored, consideration will be given to the types of contracts which are now in use and the disadvantages

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*The budget figure quoted here is recommended budget authority for Fiscal Year 1972 for all military activities, excluding AEC and other military related activities.

and the advantages of each type, and a discussion of the present day major contracts in the shipbuilding area will be undertaken, treating the attitudes and influences of each of the parties in the agreement.

CHAPTER II

A BRIEF EVOLUTION OF CONTRACTING

Introduction. Prior to World War II, the relationship between the government and private industry was basically controlled by legislation which dates to 1860. This was not the beginning as there were several legal documents prior to that time which were concerned with procurement, however because of the cost and urgency of the Civil War, military procurement was specifically addressed by the federal government in that period. Some concepts, such as the advertised procurement, date beyond the Civil War period to 1809. The sections that follow are very brief and touch only the legislative highlights of the period from the time of the Constitution to the present.

The Constitution through 1860. Article I, Section 8 of the Constitution authorizes the Congress to enact laws affecting procurement. Congress does this by enacting appropriations of funds to support those activities which it approves. The Congress has then naturally passed a number of laws and regulations designed to ensure that the sums that are provided by these appropriations are employed in a legal manner and for the purpose which the Congress originally intended. In 1792, the responsibility for purchases

and contracts for support of the Army was given to the Department of the Treasury. In 1795, a Purveyer of Public Works was established within the Treasury to act as the government's purchasing agent. Later, in 1798, a Congress declared that contracts and supplies for services for military and the naval services would be made by or under the direction of the chief officers of the Department of Navy and Army. The Department of the Treasury through the Purveyor of Public Supplies, remained responsible for the execution of orders from the military departments.

In 1808, the first conflict of interest problem were tackled through legislation. Congress passed an act which required that a clause appear in every contract let by the government to the effect that a member of Congress may not receive any benefit from contracts which he might have been instrumental in securing for friends and relatives.

Formal advertising came into being as a requirement for government contracting in 1809. The Act of 3 March 1809 required that formal advertisement be used in the procurement of all government supplies and services.

Formal advertising became a legislated requirement in government practice through the Act of 3 March 1809. This Act directed that all government supplies and services be procured from the lowest responsible bidder who answered an advertised solicitation.

Subsequent legislation, passed in 1842 and 1843 re-emphasized procurement by formal advertising. These Acts introduced and required the use of sealed proposals, public bid openings, and the first performance bond, which established forfeitures to not exceed twice the contract amount.

The Act of 28 June 1860 and the Civil Sundry Appropriations Act of 2 March 1861 were each pieces of legislation which continued the emphasis on formal advertising as a procurement technique, and beyond the revisions of later years, was the basic procurement legislation in use by the United States Government until 1947. The basic provision of the Act of 1860 is as follows:

> All purchases and contracts for supplies or services in any of the Departments of the Government, except for personal services, when the public exigencies do not require the immediate delivery of the article or articles, or performance of the service, shall be made by advertisement a sufficient time previously for proposals affecting the same. When immediate delivery or performance is required by the public exigency, the articles or service may be procured by open purchase or contract at the places, and in the manner in which such articles are usually bought or sold, or such services engaged in between individuals. No contracts or purchases shall hereafter be made, unless the same be authorized by law or be under an appropriation adequate to its fulfillment, except in the War and Navy Departments, for clothing, subsistence, forage, fuel,

quarters, or transportation, which, however, shall not exceed the necessities of the current year.[1]

Placed into practice, this legislation meant that the Government agencies could normally procure goods and nonpersonal services only by (a) public advertising for bids responsive to detailed specification; (b) public opening of the bids at a specified time and place; and (c) award of the contract to the lowest responsible bidder complying with the conditions of the advertisement for bids.

The Act of 1860 did permit purchase by negotiation when public exigencies necessitated immediate performance, and upon occasion, Congress would provide specific authority for open market purchase for such items as transportation (horses, mules), tooling (jigs and dies), medical supplies, advertising services, and secret weapons and devices.

1874 to World War II. In 1874, the Civil Sundry Appropriations Act was revised and became known as Revised Statute 3709. After revision in 1878, it continued in effect until again being revised in 1910. The 1910 revision again strongly emphasized competitive procurement by formal advertising, but in addition, listed specific exceptions which could be subject to negotiated procurements. These exceptions were expanded from the Act of 1860 and covered the following areas:

1. Emergency purchases in the event of a public emergency.

2. Purchases less than $500.

3. Procurement from the Federal Prison Industry.

4. Procurement of horses and mules.

5. Procurement of proprietary items.

6. Procurement of medical supplies.

7. Procurement of bunting.

8. Procurement of classified items.

9. Procurement of dies and gages.

This legislation represented the standard regulating instrument of the government agencies during World War I.*

The War and Navy Departments made much use of these provisions during World War I. Most of the items necessary for the prosecution of the war effort were procured by negotiation, in fact well over 50% of the total contracts were negotiated, excluding primarily only standard quartermaster items. The negotiated contract form used was the

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*An act was passed in 1901 which provided, with specific reference to the Army, that hereafter, except in cases of emergency or where it is impracticable to secure competition, the purchase of all supplies for the use of the various departments and posts of the Army and of the branches of the Army Service shall only be made after advertisement, and shall be purchased where the same can be purchased the cheapest, quality and cost of transportation and the interests of the Government considered; but every open-market emergency purchase made in the manner common among business men which exceeds in amount $200 shall be reported for approval to the Secretary of War under such regulations as he may prescribe." This is an excerpt from 31 Stat. 905.

cost plus a percentage of the cost and this format was greatly abused. Much discussion took place in the halls of government during and after the war years concerning the apparent breakdown of formal advertising procedures. No positive actions were implemented that were specifically designed to correct the situation.[2] The legislation available during the interim between the World Wars was therefore rather archaic in nature and it did not permit the flexibility that was necessary for the impending tasks of World War II. It is not at all surprising that the regulations went untested during this time as the military services were highly unpopular and there was much activity in the Congress in which the 'Weapons Mongers' of industry, both in the United States and abroad were highly criticized as profiteering through the manufacture of munitions. Military procurement budgets were small and there were several investigations by the Congress which kept matters lively.[3]

World War II. On the threshold of World War II, the deepening international situation led to additional activity on the part of the lawmakers to strengthen the national defense posture. These actions were to prepare the basic regulations which are in effect today. The nature of Revised Statute 3709 (1910 Revision) was restrictive when

viewed in the light of the free wheeling policy required to gear up for a major global war. In the period 1939 - 1940, a series of acts were passed by the Congress which were designed to ease the restrictions of Revised Statute 3709. During this time, the significant trend was away from the formally advertised toward negotiated procurements.

The important legislative actions which governed World War II procurement are outlined as follows:

Public Works Act of 25 April 1939. This act provided authorization to the Secretary of the Navy and the War Departments to enter into negotiated arrangements for the construction of public works projects situated outside the continental United States. The military departments were also authorized to employ outside architectural and engineering firms for the preparation of designs, plans, and specifications for any public works project or for the construction of any Naval vessel or aircraft. Contracts thus negotiated were on the basis of cost plus a fixed fee, which fee was not to exceed 10% of the estimated cost.

The Act of 13 July 1939. This act specifically authorized the War Department to procure special aircraft parts, instruments and accessories when the nature of the procurement was such that classification made it necessary to avoid a public offering. These contracts were entered

into on a negotiated basis.

The Multiple Awards Act of March 1940. This Act was designed to expand the production of aircraft and permitted the Secretary of War to award contracts for aircraft, aircraft parts and accessories not only on the basis of the lowest responsible bid but to the three lowest bidders, the work to be divided between them to avoid loading production facilities beyond capacity.

The National Defense Supplemental Appropriations Act of 26 June 1940. This Act gave authority to the Treasury Department to forego bidding procedures specified by Revised Statute 3709 in the purchase of strategic materials.

The Act of 28 June 1940. This Act, known popularly as the Speed-Up Act, provided authority to make advanced payments to contractors up to 30% of the contract price. It further authorized the Navy Department to enter into negotiated contracts for the acquisition, construction, repair or alteration of naval vessels or any portion thereof. The War Department was authorized to procure aircraft in the same manner.

The Act of 2 July 1940. This Act permitted the Secretary of War to enter into those contracts which he deemed necessary to construct Government owned facilities and to provide for their operation with or without advertisement.

Building on the experience of the first World War, each of the above Acts expressly prohibited the use of cost-plus-a-percentage-of-cost contract. Use of a cost-plus-fixed-fee contract was permitted, but fees were limited to a maximum of between six to seven per cent of the estimated cost.

The public exigency became operative just following Pearl Harbor when the President, on 19 December 1941, signed the First War Powers Act. This executive action removed most of the restrictions that had been placed upon defense procurement practices through the legislative actions discussed. This measure authorized departments or agencies engaged in the war effort to enter into contracts and to make amendments and modifications to contracts both existing and projected and to make advance, progress, or other payments against any contracts without regard to the provisions of the oontract law. Any such action taken of course, had to be justifiable as essential to the prosecution of the war.

To extend further, the use of the negotiation technique, the War Production Board Number Two, on 3 March 1942, directed that all contracts be awarded through negotiation. Three principle criteria were to be met through these negotiations: The primary emphasis was to be placed upon timely delivery of the procured material; the contracts

with the more difficult items should be placed with concerns with the requisite engineering, managerial, and physical resources and less complex items should be placed with smaller concerns; a contract should be placed with those firms who required the least amount of new facilities and equipment to perform against the contract. The Directive also outlined precautions to ensure that work was directed into areas of available labor and that inequities in the demographic elements were minimized. During the years of the war then, the principal means of contracting was negotiation, confirming the lesson of World War I. Procurement by formal advertisement is not an efficient means of buying war materials in a national emergency. It should be further noted that negotiation was also successfully utilized by the services as a procurement method.

Much of the regulation, both directive and legislative placed into effect during World War II was of a temporary nature and following the conflict, the military services returned to the provisions spelled out in Revised Statute 3709. The experience gained from the liberal climate fostered by expediency was to prove useful in later years.

The Post-War Years. In 1947 the Armed Services Procurement Bill was passed by the Congress and signed into

law by the President on 19 February 1948. This law, Public Law 413 of the Eightieth Congress, was effective on 19 May 1948, the day that the First War Powers Act terminated in effect as procurement authority.

The effect of this bill was to unify the Army, Navy, and Air Force procurement authority under one statute. Formal advertising is again called for as the primary means for military procurement, however exceptions were granted and negotiated purchases were permitted when circumstances might require or justify a departure from competitive advertising. Essentially this is the interpreted as allowing the contract which best fits the procurement circumstances. The Act, borrowing from the most effective procedures developed during the War, provided for the making of advance payments, authorized the Comptroller General to remit liquidated damages which may be incurred from contractor's delay, and provided for joint procurement between the services. The requirements of this legislation are set forth in the Armed Services Procurement Regulations or ASPR as they are more commonly known. Since the development of the ASPR, each of the services have prepared a set of regulations which parallels the procedures of the ASPR while at the same time particularizing them to the needs of the respective service.

In the Navy, this document is known as the Navy Procurement Directive (NPD).

Some Comments on Navy Procurement between World Wars I and II. The procurement situation in the Navy in the period from World War I until the pre-World War II years is rather well described by Vice Admiral Bowen who was the Chief of the Bureau of Engineering.[4]

From 1918, following the first World War, to 1933, little progress was made in innovations in naval engineering. There were only several ships built during this time and they showed little or no innovations in design. Propulsion systems clung to World War I technology and there was little interest on the part of private shipbuilders to introduce promising technical changes into both their naval and merchant work. This was due to several reasons; one being the relative concentration of all government work in one or more of three shipbuilding concerns. These were known as the "Big Three" and while the specifications for naval ships were controlled by the Bureau of Engineering and Bureau of Construction and Repair, the looseness of these guidelines permitted these companies to follow their own design philosophies which at the time, were very conservative. A second reason for this situation was the virtual death grip that Parsons Turbines Ltd., the Brit-

ish turbine manufacturer had on marine turbines. This was not to say that other manufacturers were not in the business, they were, and some making superior equipment, but the "Big Three" shipbuilders held licenses from Parsons for the manufacture of the Parson units in their own plants. They were therefore quite reluctant to have this profitable operation cease. These reasons along with the absence of any research facilities in the marine industry serve to explain the lack of progress. These specific reasons operated in an economy that was in a depression at the time as well, and the shipbuilding industry, in the best of times, a feast or famine proposition, was certainly as close to its nadir as it had ever come.

Against this background, the procurement methods of the Navy during this period can be examined briefly. The military characteristics of ships were determined through the deliberations of the General Board, an advisory group of senior naval officers which reported to the Secretary of the Navy. The Bureau of Construction and Repair submitted to the general board for their approval, preliminary designs which followed the characteristics determined desirable by the Board. The Bureau of Ordnance followed suit with plans and arrangements of armor and armament, and the Bureau of Engineering did the machinery arrangements, ship systems, and at that time, the electronics.

Prior to requesting bids for any new naval construction, a set of specific specifications would be prepared by the three Bureaus in the area of their responsibility. In addition to the specifications, the Bureaus would also prepare contract plans which would represent the specifications in a general way and show the general arrangements of machinery, armament, and other equipments. These specifications and plans along with the General Specifications for Machinery, Hull, Ordnance, etc., would form the contract package which would be made available to the various contractors for bid purposes.

The shipbuilders would base their bids on the information contained in the design package. They would have to use their own engineering staffs to provide the detailed plans or subcontract to a firm of naval architects for the necessary plans. There was a great deal of latitude permitted the shipbuilder under this method, however no departures for the basic design features were permitted without the permission of the three bureaus in their area or responsibility or in some cases from the Secretary of the Navy when the change or deviation was of major consequence. Needless to say, the recommendation of the Bureaus were utilized by the Secretary in the making of his decision.

CHAPTER III

CONTRACT TYPES UTILIZED IN GOVERNMENT PROCUREMENT

This chapter is designed to be a quick course in the basic types of contracts that are available to the procurement program manager. There are, of course, more variations than are presented herein, but there is sufficient information to allow for the reader to appreciate just how complex the situation is and how difficult it is to make the proper choice. In any case, there may not be a single best choice but the selection must be one of which form presents the greatest advantage or the least disadvantage to the government and acceptable to the business interests of the contractor.

FIXED PRICE CONTRACTS. Under a firm fixed price contract, a price is agreed upon before a definite contract is awarded and remains firm for the life of the contract, unless revised pursuant to the appropriate clauses of the contract such as changes or stop work agreements. The contractor must assume the full cost responsibility and the ultimate profit realized is directly related to how well the contractor manages the performance of the contract. Fixed price contracting is a basic form of contracting agreement and in the formally advertised procurement method, is the

only type of contract that may be used. With a negotiated procurement, regulations direct that the fixed price contract must be used unless, for other overbearing reasons, the use of another contract form is deemed more appropriate. The important thing to note is the required link between the fixed price contract form and the advertised procurement.

Not all procurements have the necessary characteristics to permit this contract form. It is essential that very definite specifications be available, that some productive experience be present, and that the costs of specification achievement through the production process available at the contractor's plant be predictable with certainty. It is also essential that adequate price competition exist to provide cost control incentive.

Five criteria can be used for testing these procurements.[1]

1. Adequate competition has made the initial contractor proposals effective.

2. Prior purchases of the same or similar supplies or services under competitive conditions or supported by valid cost or pricing data provide reasonable price comparisons.

3. Cost or pricing information is available, permitting the development of realistic estimates of the probable costs of performance.

4. The uncertainties involved in contract performance can be verified and reasonable estimates of their possible impacts on costs made, and the contractor is

willing to accept a firm fixed price at a level which represents assumption of a reasonable proportion of the risk involved.

5. Any other reasonable basis consistent with the purpose of the contract can be used to estimate pricing.

It is quite easy to accept the first three criteria as being sound. The fourth criterion encourages a proper division of risk between the government and the contractor, providing the managers on both sides can identify the risks and negotiate, as required by the Armed Services Procurement Regulations (ASPR), an agreement to do so. The fifth criterion is designed as a catch-all provision to permit a fixed price contract when there is a sound assurance that the risk is reasonable and the situation does not fit any of the preceding four criteria. It may happen that the pressure of losing to competition may cause a contractor to accept a fixed price agreement in order to achieve the business activity.

The fixed price contract provides for the least costly administrative effort on the part of the government. Unfortunately, only the more standard commercial, modified commercial, or repetitive buy military items can meet the criteria for this contract form.

The fixed price contract can take several modified forms which extends its usefulness and allow for contingencies. These forms are fixed price escalation, fixed price redeterminable, and fixed price incentive.

FIXED PRICE-ESCALATION. It may be, that with a long run contract, the contractor may express doubt concerning the stability of the pricing agreement due to factors over which he has no control; such as raw material costs, labor cost, or other contingencies. Such contingencies can be accommodated through this type of contract by permitting the government to assume the risk. ASPR provides for an upward price revision ceiling to be set as a percentage of the contract price when the factors forecasting such a risk can be identified. The escalation clause can and should call for a price revision downward when circumstances permit to the benefit of the government.

The escalation clause is designed to permit the government to accept the entire risk, however payments are tendered only upon the supported occurrence of the contingency. Conversely, a reduction in contract price is made only upon a downward revision in the costs to the contractor.

FIXED PRICE INCENTIVE. This type of contract combines the fixed price technique with flexibility in assigning responsibility for costs. Initially, negotiations set target cost, target profit, ceiling price and a final profit formula which is designed to provide incentive to the contractor by allowing him to share in any undercost savings due to sound management practice

which he might employ, and conversely to involve the contractor in defraying any overrun on target cost. This method of contracting also satisfies many of the conditions for the fixed price redeterminable form discussed in the following section.

FIXED PRICE REDETERMINABLE. There are several variations of this type of contract. Redetermination of pricing can be solely prospective (before contract performance) in application, retroactive (after contract performance), or a combination system (during performance). The similarities to the incentive type contract are that first, a ceiling price has been negotiated initially, and secondly, at the agreed time of price revision, the contractor makes available actual, audited performance data from the contract under review or from other similar contracts to the Government negotiating team.

One very significant difference is that unlike incentive contracts in which the degree of contractor cost responsibility is determined initially through development of a formula, the fixed price redeterminable contract does not provide for a determination of the contractor's share in any price revision until the time for redetermination negotiations has been reached. This difference is important in that the negotiations for both cost and profit

considerations at this point of redetermination are of such importance to the contractor that it is highly unlikely that he will concede any allegations of deficient cost control when the costs have already been incurred. The result, for both the government and the contractor is that demonstratable proof of either outstanding or extremely bad management can not be presented and a grey area exists in the negotiations. For this reason this form is not recommended for use except when the following conditions hold:

1. Adequate estimates of quantities of material are not initially available.

2. Specifications adequate for firm fixed price contracts are not initially available.

3. Sound initial estimates of total cost of performance cannot be made.

4. Effective competition or other reasonable justification of cost is not available.

5. The use of price redetermination would materially assist in effecting fair and reasonable pricing.[2]

At the redetermination point, the contractor is required to submit a breakdown of costs actually incurred and the best estimate of costs expected to be incurred during the remainder of the contract run. This and other data such as a government audit, form the basis upon which negotiations are held. Regulations permit the contracting

officer to take into account all performance factors, both positive and negative, which characterize the contractors efforts up to the redetermination point.

COST TYPE CONTRACTS. The cost type contract is designed chiefly for use in research and development situations involving great technical complexity with the attendant difficulty in predicting the cost of performance. Such uncertainties would make the precise definition by specification of the scope of work involved an impossibility. The cost type contract permits the government to undertake high technology development projects with essentially no risk being placed with the contractor. Several particular variations of cost type contracts are in use; the cost plus fixed fee (CPFF), the cost plus incentive fee (CPIF), and the time and materials contracts.

COST PLUS FIXED FEE. As the title implies, the cost plus fixed fee type of contract obligates the government to pay all costs incurred and a fixed fee or profit is paid, generally based upon a percentage of the costs, or in other words, the scope of the work undertaken.

The difficulties in administering a contract of this kind are reasonably obvious. First, the contractor must demonstrate that his accounting system is adequate to determine the costs applicable to the contracts, and secondly,

he must be willing to undergo careful government scrutiny of his data and procedures. Problems arising from these causes have resulted in legitimate concern on the part of the government about the use of the CPFF as a contracting form. Experience has shown that the incentives for cost control are not present and alternatives yielding cost advantages to the government are not explored nor are they followed. The generally acknowledged experience from these contracts has been higher than anticipated costs. Some estimates are unrealistic and unilateral in nature, and thus poor comparisons, others have been carefully adjusted figures which have considered all new work, scope modifications and the like. The result has been about the same degree of over-run. The basic underlying reason for this poor performance is thought to be an absence of real cost responsibility on the part of the contractor. The contractual agreement is reached with a target cost beyond which the government will not be liable. This limit may be greater than, equal to, or less than the cost originally estimated. The contractor in this situation, is morally bound to make his best management efforts to remain within this estimate but he is not under legal obligation to meet these limits. When the limit of funding is reached, the contractor ceases

work and is not obligated to complete unless further contractual arrangements are made. The contractor's fee is paid no matter what his performance on the contract.

Currently, the services are restricted from utilizing the CPFF contract types except when all of the following conditions prevail:

1. A cost reimbursement type of contract is found to be necessary in accordance with the ASPR.

2. The contracting parties agree that the contract should be fee bearing.

3. The contract is for the performance of research, or preliminary exploration and study, in which the level of effort required is unknown.

4. The contract is for development and test effort for which the use of a Cost Plus Incentive Fee contract is not practical.[3]

The CPFF type contract is prohibited from use in the development of major weapons systems and equipment once preliminary exploration and studies have indicated an acceptably high degree of probability that the development is feasible and the desired performance parameters and time schedule have been established by the government.

Procurement law (10 USC 2306(d)) limits the fee for performing a CPFF contract in various technical areas. The fee limitations are given in Table I.

TABLE I

CPFF CONTRACT TYPES AND MAXIMUM FEES

Tasking	Fee
Experimental Development and research work.	15% of the estimated cost of the contract less the fee.
Architectural or engineering services for public works or utilities.	6% of the estimated cost of the contract less the fee.
Contract in any other category appropriate for a CPFF type.	10% of the estimated cost of the contract less the fee.

Source: W.H. Riemer, Handbook of Government Contract Administration (Englewood Cliffs, N.J.: Prentice-Hall, 1968, p. 277.

There are two basic forms of CPFF contracts, the 'completion' form and the 'term' form. As the qualifier 'completion' suggests, this type of contract is for a clearly defined scope of work which should be completed with

the preparation of a final report, the contractor having fulfilled the requirements of the tasking document. If the contractor has not done this, it is within the option of the government to renew 'completion' type contracts if renewal is deemed to be in the government interest. 'Term' contracts specify a particular level of effort to be expended for a given time or term and the fee is paid upon completion of this effort after the government is satisfied that the contractor has fulfilled the requirements. If additional work is required, an entirely new contract may be formulated. In most cases, the 'completion' form of the CPFF contract is preferred.

It is possible to have a cost type contract without fees, defined simply as a cost reimbursable type. This is a useful form in contracting with universities and other non-profit institutions.

Another variation which is useful is the cost-sharing type of contract by means of which the government and industry can jointly share in a research and development effort. This is an effective varient but is only acceptable when the contractor views the result of the effort as having a high probability of commercial spin-off which may benefit his product line.

COST PLUS INCENTIVE FEE. This is a cost plus type of contract which is adjusted by a formula following completion of the task. Negotiations set a target cost, a target fee, and upper and lower fee limits. A fee adjustment formula is also agreed upon to fix the fee within the upper and lower limits. After performance of the contract, the fee is determined in accordance with the formula and the contractor's demonstrated effort to meet the negotiated targets. Technical performance on the contract is also a determining factor.

TIME AND MATERIALS CONTRACT. This is a cost plus type of contract which can be used for the procurement of services and supplies. Charges are based upon a direct hourly labor charge at a negotiated rate and materials used at cost. Various exclusions can be negotiated as can a ceiling which can not be exceeded except at the risk of the contractor. This is not a good contract form and is usually avoided, being utilized only if a relatively short contract life is anticipated or if an emergency situation exists. The Navy generally procures special diving and salvage services through this contract form.

SPECIAL CONTRACT FORMS. There are five special types of contract forms which are useful. These are:

LETTER CONTRACTS
INDEFINITE DELIVERY CONTRACTS
BASIC AGREEMENT
OPEN CONTRACT
SMALL PURCHASES[4]

A brief discussion of these contract formats follows.

LETTER CONTRACT. The letter contract, though not a desirable contract form from the point of view of either the government or contractor, is nevertheless, a very important and much utilized device.

ASPR 3 - 408 defines a letter contract as:

> "a written preliminary contractual instrument which authorizes immediate commencement of manufacture of supplies and procurement of services including but not limited to pre-production planning and the procurement of necessary materials."[5]

Because of the undesirability of this contract form as a business device, the use of it is restricted to situations where in the interest of national defense, the contractor must immediately be given a binding commitment such that the work may be started at once, or when there is insufficient time to complete negotiation of a definitive contract due to the urgent requirement to proceed with a procurement. Many procurements are developed under the second category when there is not sufficient definition of the project to develop necessary cost data, definition of concept, etc. and the letter contract will permit a start work condition such that the necessary data can be provided as a result of the early effort against the letter contract.

When a letter contract is utilized for either of the above two procurement patterns, there must be adequate assurance that the negotiations can be resolved in a proper manner and not be the cause of problems or delay. To accomplish this, there are specific rules which must be followed in constructing the letter contract. Because this contract is so frequently used as a preliminary form in a large procurement, specific rules in format apply:

1. The contractor must immediately proceed with the performance of the contract and may provide raw materials.

2. The extent and method of payment for termination of the contract shall be agreed upon. Termination may be either based upon the convenience of the Government or default.

3. The maximum liability of the letter contract shall be agreed upon and the contractor shall not be permitted to expend funds against the contract beyond that amount as specified.

4. The form of the definitive contract shall be agreed upon.

5. There will be agreement on as many definitive contract clauses as can be obtained and these shall become a part of the letter contract.

6. The extent of the contractor's effort in providing cost and pricing data will be agreed upon and defined by the letter contract as determined to be reasonable by the negotiators.

7. A good faith agreement between the government and the contractor shall be established to ensure the most rapid possible negotiation period in converting the letter contract into an executed definitized contract.[6]

Letter contracts are time limited as well, with the conversion process to be completed within 180 days of the agreement or at the 40% point in the performance of the contract, whichever might come first.

Under the provisions of a cost plus fee type of letter contract, no fees can be paid prior to definitizing the contract. Under a fixed price type of contract, progress payments may be made, however the aggregate of all progress payments made can not exceed 70% of the value of the letter contract.

It is possible, upon agreement of the parties involved, to definitize a letter contract in another form if such action is desirable. Expenditures by the contractor beyond the limits of the amount funded by the contract are not permitted unless the government elects to increase the contract amount for any reason deemed to be justifiable. Terminations are effected in accordance with the general provisions governing termination for convenience of the government as prescribed by ASPR.

The letter contract is a valuable contract form and much used in the procurement of ships, but on the other hand, it is not a good form for either the buyer or the contractor. The advantage to the government is the speed of the arrangement and the fact that the contractor's cost

data can be available prior to the final negotiation. The disadvantages are that there is no incentive for the contractor to perform proper cost control functions and he is under no obligation to completely fulfill the contract until the contract is definitized as rapidly as possible.

BASIC AGREEMENT. The basic agreement is not a contract in and of itself, but rather is a contractual device to set forth those basic contract clauses which could be considered standard clauses in all contracts negotiated between the government and a contractor. This device is used primarily for establishing a basis upon which to save time in making procurement actions with contractors with whom many repeat actions are taken. This tool would not be used in major procurements, but would be useful in procurement of repetitive items and consumables.

INDEFINITE DELIVERY CONTRACTS. An indefinite delivery type contract is similar to the basic agreement in that all the negotiations are complete except for the final establishing of quantity and delivery dates. The contract may call for pricing on a firm fixed price, price escalation, or price redeterminable basis.

This is a useful contract form in making procurements where the requirement for the material procured is well known but the quantity and time for delivery has not yet

been definitized. Use of this form would be restricted primarily to stock replenishment of supplies such as consumables and spares where the time for delivery is not yet clearly defined. Major weapons systems would not be procured utilizing this form, but it would be a useful contract type in the procurement of follow-on spares.

All such contracts are time limited, the length of the effective period being determined by mutual agreement between the government and the contractor. The time periods vary, being a maximum in a rising market situation and the shortest in a falling market. By so controlling the time of a contract, the government may theoretically take advantage of the most attractive price. Another way this is done is to negotiate an appropriate escalation clause which can achieve the same result in a long term contractual situation. Unfortunately, there are few circumstances when the escalation clause will operate in reverse, and when the negotiator for the Government expects a falling price situation due to production efficiencies or process improvements, it is to his advantage to set the time limitation relatively short.

Indefinite delivery contracts can be formulated in three distinct ways, one may require a definite quantity of material without stating delivery, the second may state

clearly the requirement for both quantity and overall time for performance, and the third type may state only an indefinite quantity. In all cases, an estimated total quantity is provided for use by the contractor.

OPEN CONTRACT. This contract form is also termed the master type or task order contract. It is used extensively in the ship repair business where firms which qualify to hold master ship repair contracts may negotiate a basic agreement with the Naval Ship Systems Command upon which the various Supervisor's of Shipbuilding, Construction and Repair may base definitized contracts for repair and overhaul of ships. These contracts do not obligate the government to procure any supplies and services during the tenure of the contract. No pricing data is contained in the contract however a provision on pricing is included to cover methods by which pricing may be effected. An excellent model of the open contract form is a basic agreement under which an indefinite number of letter contracts can be issued to definitize the basic agreement.

As mentioned, this contract is very useful for the procurement of repair parts and repair work where repetitive procurements are made from a single or only several sources of supply, usually confined to a definite geographical area. The advantage of this type of system is

that particularly rapid procurements can be effected. In the case of ship repair, a group of ship surveyors from the office of the Supervisor of Shipbuilding, Construction and Repair visit the ship to undergo the repair work and develop a written scope on the work that is to be accomplished. This effort, completed in just several days time, is then given to the holders of the master ship repair contracts in a given geographical area for their review. Bids are received several days later and the award for the repairs made to the low bidder within the framework of the other contract requirements. It is possible to have repairs started within several days of the arrival of the vessel, thus minimizing the period of time any ship is not available for operations.

This procedure, it must be recognized, is only useful in the present day for the repair of non-complex ships and ship systems. Ships in this category are limited to older auxiliary types, amphibious types, and replenishment ships. Small boats and yard craft may also be cared for in this manner. This system is seldom used for combatants or complex ships of any type unless emergency conditions compel that it be done.

In other types of procurement, pricing may be developed from standard catalogs, or through experience midway through the production run of an item manufactured in response to a basic task order.

SMALL PURCHASES. This is not technically a contract form, but is an important authority granted to government contracting officers by the ASPR to make agreements for the purchase of items which do not aggregate more than $2500 in cost. These purchases can be proprietary and on the open market, and this technique is often used to buy specific repair parts known to be of superior quality and performance than others obtained under competitive action. The limits on total value do very much restrict the usefulness of the technique but it still has great use in the ship repair business.

This form can be used for nonpersonal services and for construction as well as for spares. It does not preclude the use of formal contract negotiations if such are deemed advisable by the contracting officer.

Summary. Table II is provided as a summation of the range of contract types and the theoretical advantages and disadvantages of each to the government and the contractor. As it will later be shown, the trend is to the incentive

type contract for most major procurements. The key in the contract choice will generally be the type which permits the best management of the risk, both that which is known and that which might at the time of decision, be unknown.

CHAPTER IV

THE MILITARY-INDUSTRIAL COMPLEX

Background. No essay on the military-industrial complex, the so termed relationship between the defense establishment and the industrial capability which, through business arrangements, is supportive of the military services in hardware, consumables, and ideas, can be considered complete without a reference to the statement made by President Eisenhower on 17 January 1961 as he prepared to leave office. The statement he made on that occasion has been frequently quoted and often in a manner which is not sufficiently complete to avoid being misled from the content of the comment. He said in part:

> Until the latest of our world conflicts, the United States had no armaments industry. American makers of plowshares could with time and as required, make swords as well.
>
> But we can no longer risk emergency improvisation of national defense. We have been compelled to create a permanent armaments industry of vast proportions. Added to this, three-and-a half million men and women are directly engaged in the defense establishment. We annually spend on military security alone more than the net annual income of all United States corporations.
>
> Now this conjunction of an immense military establishment and a large arms industry is new in the American experience. The total influence--economic, political, even spiritual--is felt in

> every city, every statehouse, every office of the Federal Government. We recognize the imperative need for this development. Yet we must not fail to comprehend its grave implications. Our toil, resources, and livelihood are all involved; so is the very structure of our society.
>
> In the councils of Government, we must guard against the acquisition of unwarranted influence, whether sought or unsought, by the military-industrial complex. The potential for the disasterous rise of misplaced power exists and will persist.[1]

Critics of the defense establishment are quick to use this statement by a former President as a basis for launching an attack on what is characterized as a monstrous organizational matrix operated by irresponsible and greedy individuals, each perpetuating the others worst vices. Certainly we can quickly refute the "Dr. Strangelove" image as being far from the truth, yet the concern over the military-industrial complex continues to exist and occupies considerable space in the press and attention from other news media. The legislative branch of the Government is also very concerned as are economists and commentators on the social processes.[2]

Well known names among legislators have spoken out against the military-industrial complex. Senator William Proxmire, as chairman of the Joint Economic Committee is a loud and forceful critic of the defense procurement system.

He says:

> I speak today not to warn against some future danger of this influence.* I assert that, whether sought or unsought, there is today unwarranted influence by the military-industrial complex resulting in excessive costs, burgeoning military budgets, and scandalous performances. The danger has long since materialized with a ravaging effect on our nation's spending priorities.[3]

Later in the same address, Senator Proxmire goes on to say: "The problem of defense spending is out of control. The military-industrial complex writes its own ticket."[4]

Throughout, the Senator voices his concern about the delivery schedule of weapons systems, the level of profits in the defense industry, the type of contracts employed, the excessive costs of systems, alleged poor cost control, quality control and thus makes queries into many areas of the procurement process. At the root of this inquiry, Senator Proxmire points to the cause, the military-industrial complex.

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*The term 'influence' as used here by Senator Proxmire is exactly analogous to the influence against which former President Eisenhower warned. The warning is thought to be against the power exercised by military, political and business interests which might bring a steady progression to a militaristic society.

He says on that point:

> The connections between the military, on the one hand, and the major industries which supply it, on the other, are very close and very cooperative.
>
> The result of all this is a system which is not only inefficient but is now literally out of control. Excessive amounts are spent on overhead and supplies. Huge cost over-runs are standard occurrences. Weapons systems routinely do not meet the standards and specifications set for them.[3]

Thus does the Senator drive through to what he considers the heart of the matter. Time after time, he assails the complex as an unweildy and unresponsive mechanism:

> At the present time, it is not inaccurate or unfair to describe the United States' weapons acquisition system as a kind of welfare system for the military brass and the Department of Defense bureaucracy on the one hand, and the top aerospace and munitions manufacturers on the other. Instead of a defense production system geared to supply military needs with all possible dispatch and economy, we have a Pentagon procurement system that weakens, rather than strengthens, us. It saps our economic resources. It promotes inflation. It misuses our skilled manpower. It wastes the energies and genius of our engineers, scientists, and intellectuals, while technical and academic research is misdirected.[6]

These charges are quite serious and within the Department of Defense, a great deal of effort has been and will be continuously expended to identify and correct the failures of the procurement systems, thus giving some credit to the basis of these allegations. There has yet

to be established if there is a military-industrial complex and if the influence which former President Eisenhower warned about is actually abroad in the land. In order to present some insight into this question, the matter of national priorities and the profile of the defense industry will be examined.

Changing National Priorities and the Military-Industrial Complex. One of the sounding themes of the Subcommittee on Economy in Government has been the current balance between military and civilian spending. Citing the problems in America's larger cities, racial problems, problems of ethnic minorities, problems of pollution, housing shortages, unemployment, inter alia, the Subcommittee points to the defense budget and the Department of Defense as a culpable partner in these ills.*

Since World War II, the defense of the United States has taken the largest share of the Federal budget and has represented one of the top national priorities. Two distinct spending peaks, one in 1953 during the Korean War

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*These charges were made by Senator Proxmire in a statement before the Subcommittee on Economy in Government on June 3, 1969. U. S. Congress, Joint Economic Committee, Subcommittee on Economy in Government, The Military Budget and National Economic Priorities: Hearings, 91st Congress, 1st sess., 3 June 1969, pt. I, p. 1.

and one in 1968 during the height of the conflict in southeast Asia mark the periods of maximum attention to defense as the first priority.

The noted economist, John Kenneth Galbraith makes the following point when speaking of the element of fear to which large defense expenditures respond:

> It is now even agreed as to where the first danger to American democracy--if there is one--lies. It is not from the Soviet Union or China. The first danger is from the starvation of our public services, particularly in our big cities, here at home.[7]

One might not agree on the classification of 'first danger' by Mr. Galbraith, as he does not support the point, but there is no doubt that the greater number of cities have serious problems with the rising cost of public services, a fact made obvious by the large number of public comments made calling for Federal aid in meeting these bills.

Dr. Charles Schultze, former Director of the Bureau of the Budget and presently a senior fellow at the Brookings Institution has suggested to the Proxmire committee that there might be available, following the decline of the Vietnam war effort, 20 billion dollars once committed to defense spending that could be utilized for domestic programs. Taking into account a progressive growth in Federal revenues of 15 billion dollars yearly due to economic expansion and a seven billion dollar growth in expenditures

due to escalation and inflation in addition to the normal expansion of existing programs, he projected that in 1974 some 55 billion dollars could be available for new programs.[8] These monies would mark the shift from an unpopular emphasis on national security to more popular domestic programs of greater contemporary priority.

When Dr. Schultze gave his testimony in 1969, he was speaking in terms of what might happen. A review of what has occurred in the several years since his prediction is informative. Table III presents the impact of these changing priorities from defense purposes to domestic pursuits in both current dollars and in constant 1972 dollars.

Of some significance is the change in defense spending from FY 1964 to FY 1968 when contrasted with the spending trends since FY 1968, the peak year of the Southeast Asia effort. The net difference in constant 1972 dollars is an increase of two tenths of a billion dollars. The growth of other Federal spending has been phenomenal, totaling 68.3 billion dollars. Added to the growth of state and local spending of some 58.6 billion dollars, an overall increase in nondefense appropriations of 126.9 billion dollars has been realized over the eight year span *from* 1964 to 1972.

The effect of inflation and the increasing personnel costs can be seen by examining the data in current dollars.

The increase of 25.2 billion dollars over the period FY 1964 to FY 1972 unfortunately does not add that much in the aggregate but represents essentially the reaction of the budget to inflationary pressures. Other Federal, state, and local spending suffered similar growth, but as comparison with the constant dollar data shows, did result in a net increase in funds to procure goods and services. When compared with the 55 billion dollars projected by Dr. Schultze, the realized 68.3 billion dollar increase exceeds that figure by 13.3 billion dollars. It is of further significance to note that this occurred after three years instead of the predicted five.

The changes in the labor allocation to defense pursuits are also helpful in gaining a perspective of the change in priorities. Overall, the defense industry has dropped in employment by 2.5 million and other activity gained 8.9 million employees since 1968. Essentially all the personnel buildup for the Vietnam conflict has been returned to the civilian sector and an additional 276,000 have been added beyond that for good measure.

Lest there be some doubt that these figures are weighted to the advantage of the non-defense sector, a review of the statement made by the Honorable Robert P. Mayo, Director of the Bureau of the Budget, before the

Subcommittee on Economy in Government tends to corroborate this later data presented by the Secretary of Defense.

Speaking of the decade spanning from 1959 to 1969, Mr. Mayo says:

> Despite an absolute increase of 34.4 billion dollars, from 46.6 billion dollars in Fiscal Year 1959 to 81 billion dollars in Fiscal Year 1969, total outlays for national defense have declined steadily as a percentage of the budget outlay. The absolute increase includes 28.8 billion dollars to support our southeast Asia operations.
>
> Outlays for civilian programs have increased by 53.4 billion dollars. . . . Over 70% of the increase has been for human resource programs. . . . The percentage for civilian programs has been nearly twice as great as that for national defense.[9]

As the national priorities change to develop administration programs in the areas of health, education, manpower, housing, income maintenance, pollution control, and community development, the relative resource which supports the defense industry will grow smaller and eventually, it seems safe to predict, there may be a health-education-welfare-industrial complex. The emphasis in the area of the humanities will draw contractor interest to these topical areas and the growth will parallel the pattern of the past for the defense industry.

The Military-Industrial Complex: A profile of the defense industry. This discussion of the defense oriented industry presumes that the reader has a reasonable awareness

of the public systems in the Department of Defense which to a certain extent parallel the management structure implemented in industry. This is particularly true since the project manager technique has been implemented within the Department of Defense.[10]

The emphasis of this chapter will be placed upon some factors which pertain wholly to the defense industrial base. Factors such as corporate size, geographic dependency on defense spending, distribution of defense employment and labor force, defense contract awards and payrolls, and profit expectations serve as important indicators of the defense industry profile.

In discussing the industrial base, it is appropriate to look at the experience of the largest and most active of those firms engaged in the business of defense. Table IV presents the prime military contract awards in the time period 1960-1967 to the top 25 companies engaged in the defense business. Of the five firms with the largest total defense business, four have defense sales which total more than 50% of their gross sales. Applying the 50% criteria to the entire group of firms, only 14 do more than 50% of their sales in the domestic market and of those 14, seven transact between 15 and 50% of their total business in defense sales.

procurement, it is indeed a factor as some 1,242 billion dollars are in dispute concerning four programs. The programs involved are the rocket propulsion system for the SRAM* and the C-5A for the Air Force, the Cheyenne helicopter for the Army, and several shipbuilding programs for the Navy. As the settlements of these claims are worked out, it is estimated that Lockheed will accept as losses, some 447 million dollars in claimed development and production costs.[12]

At the other end of the scale, General Motors Corporation and General Electric Corporation do, respectively, only two and nineteen percent of their total corporate sales value in the defense sector. The massive size of their organizations is apparent when one considers the value of defense contracts these firms hold. General Electric ranks fifth as a prime contract winner and General Motors ranks eleventh, yet their diversity and size permits great market strength, both in the domestic and defense sectors.

It is also of interest to observe the relatively even distribution of contract awards to those firms occupying 10th through 20th position. Over the seven year span of

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*SRAM is an acronym for a new air to surface Short Range Attack Missile.

the table, only one billion dollars in awards separated the 10th ranked contractor from the 20th ranking. This contrasts directly to the almost seven billion difference between the first and the ninth ranked firm.

There is no correspondence between relative ranking and the percent of total sales in the defense sector. This is a widely varient figure, from a low of two percent to a high of 88%.

Geographic Distribution. Another way in which the defense industry can be profiled is through geographic distribution. Table V presents the defense contract awards and payrolls by states for the three year period 1965 through 1967. Examination of the contract awards column for 1967 reveals that there are twelve states where the total of awards exceed one billion dollars. Some of these top ranking states support a large domestic industrial concentration and a high value for defense work is not a surprise. States in this category are California, New York, New Jersey, Texas, Pennsylvania, Massachusetts, Connecticut, Michigan and Ohio. A heavy concentration of defense industry in the industrialized northeast would be a natural conclusion.

It is interesting to examine some of the other states with over one billion dollars in contract awards. California ranks first in the nation with over 17.6 billion

dollars in cumulative awards in the three year period. A study made in 1965 of the regional impact of defense spending on the economy of California concluded that because of an early concentration of the aircraft industry in the state and the remarkable growth of that industry during World War II, there was a natural supply and demand relationship which contributed to the meteoric increase in the demographic element through the development of new jobs and high salaries.[13] Los Angeles County alone saw an influx of some 1,171,000 people in the decade beginning in 1950. A crude estimate of the dependency of the population on the defense industry is made by James Clayton in his book, The Economic Impact of the Cold War. He says:

> The Census Bureau in its special report on manufacturing for that year (1963), which included thirty industrial categories but excluded government-owned plants, placed the defense employment figure at 407,500 (for the entire state) with 54% of these workers in the Los Angeles-Long Beach area and 12% each for the San Jose and San Diego areas. If these direct defense jobs support two additional indirect jobs--a crude but conservative assumption--over a million and a half workers or about one-third of all non-agricultural employees in California in recent years have been dependent on continued defense expenditures.[14]

California also enjoyed the insight of its industry for as the aircraft demand was reduced, the companies turned to research and development and were immediately

involved in the space programs sponsored by NASA. Additionally, the loss of jobs in the aircraft industry was more than compensated for by the introduction of jobs in the electrical/electronics research and manufacturing. Instead of a net loss in jobs, there was an employment increase of some 60% using 1957, the year of the cutback in aircraft production as a baseline.[15]

It is interesting to note that California is a coastal state and enjoys a climate in the southwestern sector which is highly conducive to attracting residents from other, less temperate areas of the country. There is no doubt that this enviable asset played an important role in the original location of the aircraft industry in that region and in the steady growth of the industry once founded.

It has been advanced that the federal government has always viewed the western littoral and the mountain states with greater favor than the remaining two-thirds of the country, due largely to the more recent history of that area. Thus much of the irrigation and flood control projects, railroad land grants, land development projects, etc. were government sponsored in more recent time and the momentum from the growth stimulated by these efforts is still being enjoyed.[16]

The number two state in the defense industry is also a coastal state. Texas moved ahead of New York in 1967 as a result of the final phases of the TFX/F-111 contract awarded to General Dynamics. New York enjoys third place in overall contract value, with Missouri, on the strength of the McDonnell-Douglas operation near St. Louis, in fourth place. Connecticut, another coastal state, is fifth.

Of the twelve states with over one billion dollars in contract awards, eight are coastal states. This has two possible implications, one, that the early industrial development took place near sea lanes of transportation, a fact in general more true for the east coast than the west, and as already presented in the discussion on California, the favorable climate and attractive recreation potential of the southwestern coast has been particularly successful in attracting heavy concentrations of late developing defense industry, particularly aircraft, aerospace, electronics, electrical, and research oriented firms. These types of industries, being technology intensive, employ large numbers of skilled and highly trained personnel who place a high value on leisure time activities. These individuals are usually able to command a premium wage and with the opportunities for extra pay for overtime generally available from defense contracts, earnings in the

fense sector are quite high. The high cost of developable land near the coast for dwellings is therefore not a severe deterrent and particularly on the western coast, the combination of the coastal zone and the coastal mountain range offer a nearly complete spectrum of recreational activities.

The relatively 'clean' nature of the industry is generally compatible with the coastal zone and can therefore be assured of community acceptance. Aviation is not free from pollutants by a long measure, but electronics, airframes and parts, the aerospace oriented industries, and in particular, the research or 'think-tank' operation have not faced the severe pollution problems of the heavy industry concentrated on the eastern seaboard.

One must also mention the consistent good flying weather which is prevalent in the Gulf Coast and West Coast regions. In the formative days of aviation when visual reference was required, these areas would be natural choices for the related support industry.

Another interesting comment could be made regarding this coastal concentration. Many of the plant facilities built up during World War II were government financed or built on public land. These plant facilities were directed into existing centers of population both with respect

to the location of a skilled labor force and in some cases to areas of high labor force availability. The Lockheed complex at Atlanta represents one such concentration, the NASA complex in the New Orleans region is another.

As a final note, availability of capital is important. Such capital in the form of a sympathetic banking system proved to be an important element in the success of the Route 128 complex in Boston.[17]

The political influence. The political influence and geographic distribution are highly related areas of consideration. It is submitted that much of the political influence does not receive the attention of the general public, and is good or bad depending upon one's geographical orientation and point of view. The unfortunate TFX program had political overtones which were presented by the McClellan Committee in their report on the TFX contract investigation. The report concluded in part regarding the political roles played by the secretarial level decision makers:

> Deputy Secretary Roswell Gilpatric was guilty of a flagrant conflict of interest in the TFX award. The record shows unequivocally that he deliberately attempted to mislead the subcommittee regarding his relationship with the General Dynamics Corp. as it existed before he accepted the appointment as Deputy Secretary and that he tried to equate the relation-

> ship with a small part he once played in a Boeing case. The record makes clear the fact that he was a top level policy counselor to General Dynamics for the two and one-half years immediately before his appointment and that he was a de facto member of the company's board of directors. The record shows that he participated in the TFX award proceedings and that he advised Secretary McNamara to give the contract to General Dynamics. . . . He obviously should have disqualified himself from taking any part in the decision.[18]

Similar though less damaging statements were made regarding the role played by the Secretary of the Navy Fred B. Korth,[19] and in turn by the other principals, Secretary of the Air Force Zuckert and Secretary of Defense McNamara. Most observers of the Defense Department view this decision as the symbolic wresting of the decision authority away from the senior military advisors and concentrating such authority into the hands of the civilian secretariat. The committee view on this was presented by Senator Henry Jackson who said:

> . . . I think it is in the interest of a Secretary that he have these checks and balances with him at all times. It puts him in the position of being able to say with assurance that while we all err, and we all make mistakes, that he is backed up and fortified by a system of checks and balances, a system in which many, many people participate and no one person is absolute.[20]

As another more fortunate saga of political influence, one might consider the development of the large and modern shipbuilding complex in Pascagoula, Mississippi by Litton

Ship Systems in production planning for multiple units of standard design ships. This facility will soon be employed in producing two of the Navy's newest ship designs, the LHA, an amphibious assault ship, and the DD-963, a multi-purpose destroyer type. Five and 30 ships respectively, will be constructed.[21]

The award of the DD-963 oontract to Litton was made on 24 June 1970. This particular award is of interest from the point of view of the geographically motivated political interaction. In making announcement of the award, New York Times writer Juan Vasquez described the situation as a "delicate political problem."[22] Maine Senator Margaret Chase Smith is a ranking minority member of the Armed Services Committee, and with the Bath Iron Works Corporation of Bath, Maine a very close second in the contract competition, the roles played by Senator Smith and Senator John Stennis of Mississippi, the chairman of the committee were bound to be in strong opposition. The influence of Mrs. Smith could beseen in her support of an amendment proposed by Representative Louis C. Wyman, New Hampshire, which passed the House of Representatives. This amendment was designed to require the contract to be split and construction of the 30 ships would be by law, accomplished in two different shipyards.[23] (It is presumed of course, that one of the ship-

yards would be that of the Bath Iron Works Corp. because of their close standing in the competition.) Her vocal support for the General Accounting Office investigation which was initiated at her request following a Bath Iron Works Corporation protest of the circumstances if the contract award was aimed directly at discrediting the extremely careful source selection and review procedures conducted by the Navy and the Department of Defense. The amendment was rejected by Senate vote and the contract award was cleared by the General Accounting Office in the final analysis.[24]

As a standing courtesy to members of Congress, the Department of Defense follows the practice of first notifying the member of Congress from the affected district of an impending contract award to a firm in that district. This practice permits the Congressman, if he wishes, to advise his constituents of the award prior to public announcement. Political interest in the Defense Department's activities is real, probing, and often demanding.

The Defense Industry: A View of the Financial Profile. It is probably an understatement to say that the defense industry is anything but static. In this age of burgeoning technology, a weapons system may be moving off the production line one minute and be rendered instantly

obsolete by a concept or sketch on a draftsman's board the next minute. Greater systems performance has been constantly a primary goal and complementary technology is being sought out to match each advance in the fields of electronics, propulsion, etc., to achieve an integrated system without enhancing obsolescence. The technical effort needed to develop and produce these weapons systems has increased at a geometric rate. As a measure of this increase, the Defense Department's budget for research and development increased from 2.9 billion dollars in 1955 to 5.2 billion dollars actually expended in FY 1971. A further increase of one billion each year for FY 72 and 73 is programmed in the budget.[25]

Capital investment has been a new requirement for the defense contractor who would be competitive in the defense business as technical requirements have become progressively more demanding. Additional plant facilities may be necessary; new laboratories, new tooling and plant equipment, and modernized existing facilities in order to keep pace with the most advanced production methods are not luxuries but essential to competitive success as well as to the industrial mobilization base. This problem is not one for the

industry alone, but a great many actions and policy decisions of the Department of Defense are influenced by the forecast of a desirable impact on the capability of the defense industry.[26]

Employment patterns have changed to support a more technology intense enterprise. Firms engaged in the defense sector have increased the number of scientists and engineers in their employ. Further, the nature of the various technical disciplines that have become necessary to the defense contractor,--electronics, nuclear physics, the aerospace sciences, missile and rocket technology--, each demand their own administrative organization which is specialized through the broad spectrum of research, development, test, and production facilities, materials science, design expertise, production equipments and methods.

Competitive superiority is difficult to acquire and even more difficult to maintain. This causes serious risks to be involved from the expenditure of funds to constantly improve plant facilities and equipment, incorporate the newest and most effective management innovations, engage in independent research and development, upgrade the skills of employees, and otherwise take actions which will advance the firm capabilities.

Management must therefore be capable of accurate assessment of the customer's advanced requirements in order to be prepared and in a competitive posture.* This entails estimation of the 'unk-unks', the unknown-unknowns which proliferate in the major 'fringe technology' weapons development programs and do so much to make the procurement of these systems a high risk evolution.[27] Most defense contractors will agree that this area represents the most vexing and perhaps the least understood area in the acquisition of weapons systems.

In view of the present defense market consideration, the high cost of major weapon systems has limited the number that can be procured and greater effectiveness is hoped for to limit the number of units required. The strategy followed by the defense contractor has been to rely on high quality.

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*The Navy attempts to ease this risk through the conduct of a series of briefings sponsored by the Naval Material Command under the title of the Advanced Planning Briefings for Industry. During this week of meetings, held on an annual basis, engineers, scientists, and managers of the Naval Material Command make presentations to representatives of industry covering the latest trends and developments which might have a bearing on weapons systems in which the Navy is interested. From these briefings, industry can infer areas of independent incentive for research, development or technology spin-off for their companies.

Besides quality and ontime delivery, firms are also under strong pressure to reduce development time and maintain tight cost control procedures. The strategy of firms wholly committed to the defense business generally has as primary goal, long-run survival.

It is the task of procurement policy to harmonize cost reduction and efficiency in the short-run and growth and survival in the long-run. It is a difficult challenge.

The industrial complex and profits. Profits serve as a measure of the effectiveness of company operations. This fact is no less true of those firms engaged in defense oriented activities. The significance of defense industry profits is well characterized by the extent of the controversy which exists within the political-military-business community concerning the permissable degree of profitability to firms so engaged.

There are many points of debate and this section is not designed to present any one view. Rather, some of the more vexing problems will be pointed out, and some representative comments presented.

Profits can be measured basically in two ways: as a percentage of total sales, or as a return on capital investment. A third method is also commonly used, that method being return on stockholder's equity, a figure obtained by

reducing the total capital investment by the cost of the long term debt. All of these are valid measures and could be readily adapted to comparison if the accounting methods used by the firms involved permitted such direct comparison. Because of the possibility that a contractor can and might report costs dishonestly in order to enhance and thus cloud his actual situation, the Renegotiation Act of 1951 and the Truth in Negotiations Act of 1962 were enacted. This legislation is designed to permit the government to properly review contracts and recoup funds paid in excess of costs plus a reasonable profit, and to provide government negotiators a tool with which they can require a contractor to present confirming cost and pricing data. The goal in every case is to reduce costs and to ensure that pricing policies used by contractors are honest and fair.

Table VI represents the after tax profit based upon sales of several segments of industry for the years 1957 through 1964. This data points up the fact that profits of the defense industry appear to be consistently lower than those of other industry. This conclusion is born out by a look at another set of data from a different source. Figure 1 is a plot of profit as a percentage of sales against the year of operations. The upper curve is developed from a sampling of about 11,000 U. S. companies, the data being processed by the Federal Trade Commission/

Securities Exchange Commission. The lower curve is plotted from data gathered by the Renegotiation Board as a result of their activities. This later data is not entirely adequate as it does not separate those contracts which pertain wholly to the Department of Defense from the wide range of government contracts which were studied, and there is no comparable data on return on capital investments. It is presented as indicative, noting the somewhat higher values as opposed to the data on the Aerospace Industry. It can be generally said that the difference can be explained by a purification of accounting methods. After the Renegotiation Board studies a particular procurement action, they enter into new negotiations based upon the actual costs they found in their study. During the study, some accounting methods and other charges are generally rectified and the figures change slightly.

On the other hand, a review of the data considering profit based upon total capital investment yields an interesting and perhaps more valid comparison. The data from the Federal Trade Commission/Securities Exchange Commission on the 11,000 companies is replotted as percent profit based upon the total capital investment. The data on the defense industry is the result of a study of high (over 200 million dollars) and medium (between 25 and 200 million dollars) volume defense contractors undertaken by the Logistics

Management Institute. This review is considered to be the best and most authoritative study on defense profits that has been made up until now.[28]

The Logistics Management Institute describes profits as return on stockholder's equity, and return on capital investment, as well as return on sales. Figure 2 presents this data for comparison. Note that the split of commercial business shows a more profitable trend in the late 1960's, reflecting a finding of the study that additional diversion was sought in the nondefense markets. The poorer performance in the commercial market in the early 1960's is primarily due to large losses of several of the major companies. The larger companies also exhibit a slightly more successful performance than the medium volume suppliers. This increase of performance is thought to be primarily due to government actions in providing greater capital assistance to the larger companies in the form of plant facilities, equipment, and progress payments.

This review should show that the defense business does not hold the profit potential that commercial enterprise generally yields. The strong accusations regarding massive profits are usually the result of incomplete data or studies having a bias which distorts the conclusions.[29] Chief among

the questionable pictures is one presented by Dr. Murray L. Weidenbaum,[30] now an assistant Secretary of the Treasury, but a professor of economics of Washington University at St. Louis at the time he completed his review. The main faults of the Weidenbaum study are thought to be the sample size (only six defense and six nondefense firms were used), and the fact that he did not attempt to separate the commercial business from the defense business of the defense firms prior to drawing conclusions, and thirdly, there was no attempt in his study to compare firms with generally similar operations and product types. The criteria he used was similarity of sales volume as reported by the Fortune Directory. It is considered that such criteria would not yield an entirely meaningful comparison and it will be shown in later data to be presented, that the commercial work of most defense firms is a more profitable undertaking than the defense projects.

An attempt has been made to point up some of the objectionable features of the Weidenbaum report, yet some notable people lend a great credence to this material. The report is used by the Joint Economic Committee as a general baseline[31] and Vice Admiral Rickover[32] utilizes the study as a basis for some of his comments on the matter of defense profitability.

More recently, the latest listing of the top 500 industrial concerns by Fortune presented the performance of these companies for the 1970 calendar year.[33] As expected, because of the downturn of the economy and the continued inflationary trend, 1970 was not a banner year for either the commercial or the defense industry. The return on capital investment for all firms in the top 500 averaged 6.5 percent. Sales dropped 12 percent to 21.7 billion dollars. A quick review of the performance of some ten major defense suppliers suggests that in this sector of the business world, even lower profits (offset by large losses expected from some contractors) will be the financial story of 1970. It should be noted that some of the larger companies were involved in financial difficulty with government contracts; among these: Lockheed Aircraft, Boeing, General Dynamics, had not yet submitted data.

It might now be safely concluded that the defense industry does have lower profit potential than commercially based enterprise. One question that must be addressed is that of the credibility of the data that comes from the industry, in short is the accounting correct and honest and are there some discrepancies to be noted?

One of the vocal critics of high profits in the defense industry is Vice Admiral Rickover. He has, in his

appearance before the various Congressional committees, been a strong proponent for the uniform accounting standards as a legislative tool to ensure that the government is receiving fair and just measure for the defense dollar. In 1968, he appeared before the Joint Economic Committee on the subject of high defense industry profits.[34]

In testimony before the Committee, he compared the profits reported by five representative contractors to the profit figures determined by government auditors. Table VII gives the results of this comparison.

TABLE VII

COMPARISON OF REPORTED AND ACTUAL AUDITED PROFITS OF FIVE DEFENSE FIRMS

CONTRACTOR	PROFITS REPORTED AS PER CENT OF SALES	PROFITS DETERMINED BY GOV'T AUDIT, AS PER CENT OF SALES
A	4.5	10.0
B	12.5	19.5
C	11.1	16.9
D	(2.0)[a]	15.0
E	21.6	32.7

[a]Reported by the company as a loss.

Source: U.S. Congress, Joint Economic Committee, Economics of Military Procurement: Hearings, 90th Congress, 2nd sess., 14 November 1968, pt. II, p. 12.

The discrepancies between the reported profits and the audited figures are obvious and provide a strong argument for a uniform accounting system in order to construct a standard basis upon which to judge profits, either against sales or total capital investment. Not every firm is in the business to try to prevaricate its profit position to the government. Most firms will staunchly defend the figures which they present, however there is room for improvement in the handling of many charges which should be broken into finer detail to provide a more applicable distribution of charges.

Table VIII shows how the profit targets that are negotiated for the various contract types are being met. The data base is from FY 1959 through the end of 1963. The aggregate worth of the contracts considered in the study was eleven billion dollars.

This table spans a period of change in the procurement policy when the incentive type contract was being emphasized. The correspondence between the negotiated profit and the actual profit earned is in quite close agreement overall. The higher allowed profits can be associated with the higher risk contract forms. It also is interesting to note that the earned profit levels for the higher risk contract types were also the highest, although these levels

did not exceed the negotiated profit levels. The cost plus fixed fee appears to be the least desirable from the standpoint of profit, however the problems that such a contract type can solve for a contractor are considerable in number such that from his point of view, the profit may not be the most important consideration.

TABLE VIII

COMPARISON OF NEGOTIATED AND ACTUAL PROFITS FOR SELECTED CONTRACT TYPES: 1 JULY 1958 THRU 31 DECEMBER 1963.

TYPE OF CONTRACT	AVERAGE NEGOTIATED PROFIT (PER CENT)	AVERAGE EARNED PROFIT (PER CENT)
FIRM FIXED PRICE	a	a
FIXED PRICE REDETERMINABLE	9.3	8.6
FIXED PRICE INCENTIVE	9.3	9.2
COST PLUS INCENTIVE FEE	6.4	7.2
COST PLUS FIXED FEE	6.4	6.1

a. Data was not available.

Source: U. S. Congress, Joint Economic Committee, Economics of Military Procurement: Hearings, 90th Congress, 2nd sess., 14 November 1968, pt. II, p. 13.

A further claim made by Vice Admiral Rickover was that the negotiated profit ranges were increasing at a 'shocking' rate. His conclusions were basically drawn from the results of data tabulated in Table IX. It should be noted that these are negotiated targets which represent the latest emphasis in profit polity as enunciated by the Department of Defense.

TABLE IX

NEGOTIATED PROFIT RATES ON DOD CONTRACTS

TYPE OF CONTRACT	PROFIT BASED ON PER CENT OF COST		PERCENTAGE INCREASE
	1959 - 1963	1966	
FIRM FIXED PRICE	9.0	10.6	18
FIXED PRICE INCENTIVE	8.9	9.8	10
COST PLUS INCENTIVE FEE	6.0	8.2	37
COST PLUS FIXED FEE	6.2	7.6	23
AVERAGE INCREASE	7.7	9.7	26

Source: U. S. Congress, Joint Economic Committee, Economics of Military Procurement: Hearings, 90th Congress, 2nd sess., 14 November 1968, pt. II, p. 11.

The profit percentages tabulated utilize the 'weighted guidelines'* method of computing the target profit the computation of which is based upon the estimated costs projected by the contractor.[35]

This broadly based growth in the profit potential for the defense industry expresses the goal of the management policy of the Department of Defense under Secretary of Defense McNamara. When considered in the light of public statements made by the Secretary, the policy is not surprising. He said in part:

> I want to emphasize that our objective here is not to cut the profits of defense contractors. If anything, they are too low. They average about three and one-half percent of the selling price. This seems to me to be on the margin of being an inadequate incentive for defense work.[36]

Mr. McNamara believed that the problems lie particularly in the way things were bought, not so much in the profit permitted when these same articles were procured. For all this favorable action on his part to increase profits,

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*The weighted guidelines method of computing profits was introduced in 1964 as an attempt to move profit negotiations from a historical base to a rational series of computations which would be designed to allow credit for financial and technical risk within the type of contract selected. In practice this means that because the risk is greater with a fixed price type of contract, the profit guideline could be established at between five and seven percent of the target cost. Additional factors which would bear in the computation would be added to this figure to yield the final profit figure. As a comparison, a cost plus fixed fee contract might only be negotiated with a risk allowance of between zero and one percent of the target cost.

the defense sector still refers to the McNamara period as the "McNamara Depression," chiefly because of the way procurements were effected. Large, multi-year procurements meant fewer bidding opportunities and the opportunity at the same time for the winning contractor to reduce his cost. He also pushed hard for the re-establishment of price competition whereever possible as well as the well-publicized shift to contract forms which passed a greater risk to the contractor. Even with the generally higher profit levels, the management of the defense industry was not overly joyous about these events.[37] Mr. McNamara remains as an unpopular figure from both sides of the military-industrial complex.

As a summary view of the profit picture, Figure 3 presents the three accepted modes of profit measurement, per cent of total capital invested, per cent of equity capital, and per cent of sales* in such a manner to permit comparison of the relative behavior of each of the measures. Some of the indications have already been pointed out in previous

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*Of the three measures, per cent of equity capital will yield the highest values for profit. This is due to the removal of the corporate long term and short term debt from the computation. Total invested capital includes the debt as a factor and is generally the cause of any variance in the trend of the plots of the two measures. Profit as a per cent of sales is self explanatory.

discussion and are further confirmed by noting the trends of this plot. Defense contractors generally enjoyed high profits in the decade of the fifties when other business was lagging somewhat. In 1961, the picture changed when downward trending defense business profits, by any of the measures, fell below the level of commercial business which was moving upward. There has been some stability and some recovery in defense profits since 1964, perhaps attributable to the management policy of Secretary McNamara. Even with this slight upward trend, the commercial activity of the defense industry has been several percentage points higher than the defense work throughout the sixties. As a forecast, the seventies will yield a similar picture.

The rather interesting comparison between the profit picture for the medium sized contractor and the major contractor is made clear by reference to the total capital invested curves. The better indicated performance of the large firm is due to the greater government share in the investment for production facilities of a special nature. Such things as plant equipment, tooling (jigs, dies, etc.), land, and buildings all reduce the capital investment required of the large firm and increase the yield for him against this criteria. As another factor, the larger firm,

with the larger dollar value and greater length of time involved in the performance of a contract, will have larger and more frequent progress payments which will reduce the need for a firm to borrow working cash, also improving performance against the total capital investment category.

Later projects such as the F-111/TFX and the C-5A have proven to place a severe cash flow strain on the contractor even when government progress payments have been considered. These projects have materially contributed to the downturn in the defense business profit picture.

The data presented through Figure 3 is that which resulted from the study by the Logistics Management Institute, mentioned previously in this discussion.

Summary. This sweeping background of the military-industrial complex should be sufficient to lead to several conclusions regarding the defense industry.

Since the political judgements of the Korean War, the United States has chosen to operate two economies, one for the commercial base and the other dual economy for defense. This decision has generally met with success, although not all segments of the economy escaped without some harm.[38] The military-industrial complex can therefore mark its birthday and of course, it has the 'cold war' as its continuance.[39] The spending of large sums for defense was a

natural adjunct to the foreign policy of the United States and a supportive defense industry in the 'dual' economy was sustained.

Technological change was another factor which necessitated the military-industrial complex. It was highly important that the western world remain a leader in the sciences. Only the government through the management of the Department of Defense could accomplish this end.

President Eisenhower's famous speech can now be quoted to express his thoughts beyond the point at which critics cease to use his word. He continued:

> A vital element in keeping the peace is our military establishment. Our arms must be mighty, ready for instant action so that no potential aggressor may be tempted to risk his own destruction.[40]

So in truth, President Eisenhower was not saying that the United States should not have a strong defense industry in conjunction with a strong military organization. He may not have desired such an arrangement, but he realistically counseled for the present age:

> Until the latest of our world conflicts, the United States had no armament industry. American makers of plowshares could, with time and as required, make swords as well.
>
> But we can no longer risk emergency improvization of national defense. We have been compelled to create a permanent armaments industry of vast proportions.[41]

We now have such an industry, and we have a military-industrial complex. The trial will be to manage its awesome capability wisely and well to meet the threat that our political leaders see to the national interests of the United States. That such a capability is vital to our well being as a nation goes without saying.

CHAPTER V

TRENDS IN INCENTIVE CONTRACTING

Introduction. The incentive contract type became a particularly important procurement strategy for the Department of Defense during the McNamara years, due largely to the emphasis he placed upon the use of this form. The goal was, of course, to correct deficiencies that were becoming more obvious with the cost reimbursement type of contract and to encourage a reduction in costs to the government. The concept of the incentive contract is not new*, but the management strategy to replace the Cost Plus Fixed Fee contract with an incentive type is a key management policy decision from the McNamara era.

Incentive provisions were to be carefully employed to maximize the effect of the profit motive which characterizes the successful commercial ventures of industry. The rewards for this effort would be scaled to be maximum to

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*The incentive contract was developed in part because of the opinion of many government procurement officials who believed the cost reimbursement contract contributed to the inefficiency of contractors. The cost reimbursement contracts were felt to be instrumental in causing large cost over-runs and unnecessary changes to the basic contract. The intent of the basic contract incentive device is to induce the contractor to improve program management by sharing with him a portion of the cost savings which result from his more careful management.

the efficient producer, moderate to the mediocre producer, and poor or even negative to the poor manager. With a direct tie established between contractor performance and his profit level, the maximum amount of self motivation should be the result. Since about 1962, the Department of Defense procurement agencies have made steady progress to substitute the general profit incentive approach for the fixed fee approach. To be successful however, the government must permit the greatest latitude in management actions to the contractor and should participate in only the most essential management functions. Also implicit in this is that the technical requirements of the procurement have been properly, completely, and carefully managed.

Review of Contracts Types Employed. The yearly percentage of cost plus fixed fee and incentive contracts can be compared through study of Figure 5. It is clear that the effort to increase use of the incentive contract has had extensive results and the trend is very clearly marked from Fiscal Year 1961 onward.

The quantitative success of the policy appears to be fact, however one might justifiably inquire concerning the quality of the new contracting. There has been an effort to improve qualitatively through improvement of contract terms to discriminate in terms of final profit between good

performance and bad, and between effective control of cost or waste. Table X presents the changing patterns of use for the various contract types during the period 1955 through 1965.

Furthermore, the Defense Department estimates that "ten cents is saved for each dollar shifted from CPFF (cost plus fixed fee) to other terms of contracts."[1] To achieve this saving in contract costs, some $5.5 billion dollars worth of procurements each year have been shifted from cost-plus-fixed-fee to firm-fixed-price and fixed-price-incentive contract forms. The estimated cost savings in the period FY 1963 through FY 1965 are as follows:

TABLE XI

ESTIMATED COST SAVINGS THROUGH CONTRACT CONVERSION, CPFF TO INCENTIVE FEE

Fiscal Year	Estimated value of contracts converted from CPFF[a]	Estimated cost savings per year
1963	$4.3 billion	$436 million
1964	$6.2 billion	$616 million
1965	$6.6 billion	$658 million

[a]CPFF (cost-plus-fixed-fee) contract form.

Source: Department of Defense, The Secretary of Defense, Memorandum for the President, Defense Department Cost Reduction Program (Washington: 12 July 1965), p 11.

The Cost-plus-fixed-fee contract form, its rise and fall. The cost-plus-fixed-fee contract was a useful and almost mandatory tool for the procurement of weapons systems during and following World War II. The rapidity of the mobilization effort, the relative inexperience of many firms in developing new weapons, and the lack of any centralized procurement agency were all reasons which reinforced the use of this contract form. Subsequent to the war, the character of defense procurement changed from predominantly production contracts to contracts for research, development and production of experimental models and missiles. This trend resulted in an even greater expansion in CPFF contracting. Considering the risk involved and the cost uncertainties in this type of procurement, the CPFF contract was a highly suitable choice.

Table XII serves to amplify the situation for the time period in which the change took place. Moreover the cost plus fixed fee contracts became standard for use in the procurement of research, development, and production of experimental systems based upon the research conducted.

The period from 1955 through 1962 might be described as the age of sophistication in weapons systems, the heavy emphasis at that time was on research and development and because the cost plus fixed fee contract form was the standard for this type of work, its use accelerated.

In 1962, Secretary of Defense McNamara declared his policy to reduce the use of the cost plus fixed fee contract. He said in part:

> Both Department and industry officials agree that cost plus fixed fee contracts not only fail to provide incentives for economy, but actually deaden management efficiency by removing the need for either the Department or the contractor to estimate costs accurately, and to plan and control programs tightly.[2]

The Secretary described the management atmosphere resulting from the cost plus fixed fee contract very succinctly. The cost plus fixed fee contract form commits the government to pay all costs plus a guaranteed profit and the contractor is neither rewarded for good management or penalized for poor management. Another more insidious problem exists with the cost plus fixed fee contract. It is tempting to the contractor to maximize the projected costs during the negotiation. With the fee set in the contract, the contractor sees no benefit for himself in strongly instituting cost control measures. In fact, should he choose to do this, he more often than not will prove his estimates to be incorrect. As a second factor, but no less important, he recognizes that the actual costs incurred against the lead contract would be used in the negotiation of a follow contract which might be on a fixed price basis. The higher

the actual cost experience on the cost plus fixed fee contract, the higher the fixed price which will be allowed on the follow-on procurement. Efficient operation by the contractor against the requirements of the second contract is assured and will yield good management a high return.

The cost plus fixed fee contract does, however, still retain a useful role as an emergency device. A manager may, when he does not have the opportunity to accomplish the requisite planning, utilize the cost plus fixed fee form as a mechanism to begin effort on a large development program when circumstances demand.

A study made by a graduate student at the University of Nebraska compares 47 representative cost plus fixed fee contracts with the results from 60 incentive type contracts.* He reports that findings indicated an under-run of 1.08 per cent on the 60 incentive contracts based upon a total negotiated cost of 2.1 billion dollars.[3] A negotiated target profit of 8.1 per cent was increased to 8.3 per cent through the incentive provisions. The increase in contractor profits

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*Fifty-one contracts were of the fixed price incentive type and nine were of the cost plus incentive fee type. Sharing arrangements ranged from 95/5 to 50/50. The composite sharing arrangement averaged to be 80/20. Target profits ranged from 3.9% to 12%, with a composite target profit of 8.1%.

was 4.3 million dollars and the reduced costs to the government totaled 22 million dollars. When the additional 4.3 million is deducted from the government's savings, the net cost reduction is 17.7 million dollars.[4]

The 47 cost plus fixed fee contracts had an initial estimated cost of 328 million dollars. An overall net over-run of 1.8 per cent was the experience. Individually, the performance of the cost plus fixed fee contracts was rather poor. Nearly half experienced over-runs ranging between 30 and 104.4% of the estimated cost. This compares to the highest incentive contract over-run of about 25 per cent of estimated cost.[5]

Table XIII presents a synopsis of the situation described in the previous paragraphs. Additional studies made for comparison by researchers have yielded generally similar results. In a survey of 139 fixed price incentive contracts completed by the Navy during the eight year period from 1954 to 1962, the researcher determined a net under-run of 1.7 per cent.[6] Figure 6 is a plot of the distribution of the outcome of these contracts. Some 83% of the contracts experienced final return costs within the range of plus or minus ten per cent of the target cost. The overall result of the study is tabulated in Table XIV. The contracts were divided into

year blocks of three, two and a single year for consideration of negotiated and actual cost and profits. The curious feature of this data is that generally better performance was achieved in the first time period considered, gradually deteriorating until a net over-run was experienced in the 1960-1961 time period. Performance then improved again in 1962. This behavior is not explained, however it would seem that sample size and dollar value of the individual contract would cause a bias to the data. The contracts studied in 1960-1961 were of a higher average value and the two-thirds over-run bias of the data represents a considerable impact. Further, examining the three year period from 1960-1962 results in a comparable sample size and reduces the over-run to about 3 per cent. The performance then nearly approximates a straight line relationship with a deteriorating slope over the three sample periods.

The positive effect of the incentive type contract has, nevertheless, been generally satisfactory in achieving some additional measure of cost control, and meeting the needs of both the contractor and the government through the flexibility and variation of type available. The services can properly emphasize any factor of significance through appropriate use of the weighted guidelines and achieve a

profit posture which comes close to optimizing the direction of the contractor's efforts.[7] This ideal relationship does not accrue automatically with the incentive contract however, and must be carefully and intelligently designed into the contract.

Continued Need for the Cost Plus Fixed Fee Contract. The incentive contract alone is not the complete answer to the structuring of the government-industry interface. Certainly the continued use of the cost plus fixed fee contract will characterize research and development and firm fixed price contracts will be utilized in those situations when competition can be achieved, either through second-sourcing* or advertised procurements. This kind of versatility will be absolutely necessary to be certain that the government received the full benefit of the free enterprise system.

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*Second-sourcing is that procurement strategy followed when competition is introduced at the completion of the research, development and prototype testing phase. This is done by making all the data developed by the lead contractor available to all interested and responsive bidders and selecting the winner on the basis of a firm fixed price contract. This strategy may also be followed when a higher rate of production is required.

It is also axiomatic that the incentives that constitute the incentive contract structure such as the profit-sharing rate,* the matching of the risk with the sharing rate and the influence of the combination of these factors on the contractor must be selected with the utmost of care. It is not always obvious which treatment of the sharing proportion will yield the better result. A Rand study points out that: "At present, there exists no useful empirical information relating cost performance to the sharing proportion."[8] It therefore does not follow that the lower proportion for the contractor will yield lower costs for the government if the contract is completed under the negotiated cost. The value of the high contractor share percentage must be considered in the light of the degree of motivation achieved. It is likewise necessary to

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*The profit sharing rate is represented by the percentage of the net difference between the negotiated target cost for a contract and the actual costs charged to the contract. Thus a sharing rate of 80/20 would mean that the government would receive 80% of the net difference, and the contractor 20% of the net difference of any under-run. In the case of an over-run, the government would suffer additional costs of 80% of the over-run, the contractor's share being 20%. It can be seen that a contractor would take careful cognizance of the risk involved before agreeing to operate with a sharing rate much greater than 80/20. In itself, the incentive contract is a strong motivating factor to completely and properly assess the risk.

Currently, the sharing rate is about 80/20 for most incentive type contracts.

couple this influence with the drive the contractor sees to minimize the cost of the weapon system. By combining the sharing rate with well chosen performance incentives, the lower bound of cost can be controlled to a certain extent. The goal of this strategy is to prevent the contractor from compromising the quality of the weapon system in order to overachieve against an attractive contractor bias of the sharing rate. Further, successive incentives might be considered as a means of controlling myopia which a contractor might exhibit if a short term gain situation might be induced during the development stage. These are just some of the considerations. There are others which fall beyond the scope of this discussion,[9] but it is sufficient to say that the use of the incentive contract as a tool is an extremely complex proposition which must take into consideration many factors, time phased over the performance life of the contract. Careful consideration of all factors however, will allow the contractor and the government to develop a document which can achieve the best working relationship for both parties.

Incentive Contracting: Some Criticisms. Criticism of the incentive contracting method has not been absent. Because targets are based upon target costs, critics have

pointed out that a contractor can inflate his costs and thereby induce the system to yield a greater profit to him. Critics feel that cost savings will not be realized, rather the contractor will perform against an unrealistic, overpriced target cost which will work to the contractor's net advantage.[10]

An additional criticism of the incentive contract is that some believe that the real and only incentive is to cause the contractor to play a bargaining game with the government. He is in fact rewarded by his ability to "sell an inflated cost estimate during contract negotiations,"[11] and not his efficiency in controlling costs.

Cost estimation is therefore an extremely important element in the development of a contractual relationship involving incentives. To this end, the Truth in Negotiations Act and the present drive to achieve uniform cost accounting standards will materially assist in overcoming some of this diaadvantage. Both government and industry have studied this problem and to some extent, reached differing conclusions.[12] The industrial interests indicate that they have collective concern for the manner of implementation and interpretation of the Act at the various levels of government:

> Major criticisms of regulatory implementations of PL 87-653 have been directed at . . . optional application of data submission and certification requirements to contracts under $100,000, failure to provide adequately for recognition of the exemptions stated in the Law, and audit provisions covering after-the-fact performance cost reviews under fixed price contracts.
>
> From a practical standpoint, the cost of compliance with existing implementing requirements, both in terms of absolute dollars and loss of productive labor time is enormous. Furthermore, Industry believes that this cost greatly exceeds the benefits derived.[13]

In turn, from one of the most vocal members of the Navy's Material Command, Vice Admiral Rickover:

> First, the Truth in Negotiations Act assumed that costs and profits can be measured. Without uniform standards of accounting, this is not possible. . . .
>
> Second, contracting officers may bypass the Truth in Negotiations Act by determing that competition is adequate, even in negotiated procurements. . . .
>
> Third, requirements for cost data under the Truth in Negotiations Act can be waived.[14]

Later in his testimony, Vice Admiral Rickover called for stronger provisions of the Act and a limitation of waivers such that no contractor doing more than one million dollars in total business per year would be eligible for a waiver.[15]

These criticisms point out just how wide apart the managers of industry and in the Department of Defense are on this matter and also underscores how important cost estimation of high accuracy is to the contracting process, particularly incentive contracts.

It must also be conceded that the advantage lies with the contractor in the bargaining process. The superior knowledge which a contractor has at his disposal regarding costs, and the lack of competition for the advanced weapons systems places the government at an effective disadvantage.

It is of course not sufficient to obtain good cost data but the weapons system must be fully defined. Only by precisely defining the proposed weapon system can the defense department achieve reliable cost estimates. The incentive provisions will not be effective otherwise.

Management Changes to Encourage the Proper Use of Incentive Type Contracts. The incorporation of a major change to the Armed Services Procurement Regulations designed to encourage the use of the incentive contract form is a significant management action.* This change is directed toward replacing the cost reimbursement type of contract with the incentive type in those situations when it is not possible to achieve competition through a

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*Change number 8 dated 15 April 1962 rearranged the preferred order of contracts in the sequence of decreasing cost responsibility to the contractor; from the firm fixed price contract to the cost plus fixed fee contract. The alignment then is from the type offering maximum incentive to the type offering the least incentive.

formally advertised procurement. It is also considered appropriate under the authority of this change, to utilize the incentive contract form for development of weapon systems, an area where the cost reimbursement contract only would be acceptable.

Performance incentive provisions have also been recommended for the procurement of major systems where administratively practical. In addition, the ASPR recommends that all of the performance factors (cost, system performance, and delivery parameters), be a consideration in a competitive process to select the prime contractor. Thus contractors competing for the contract would propose targets in cost, performance and delivery. The choice of the contractor would then be based upon the best of these proposals. This procedure does have merit in that following an incentive contract based upon the contractor's own proposal, there is a strong tendency to encourage the contractor to make a more realistic proposal than if the contract were to be a negotiated cost plus fixed fee type.

Further incentives are designed to increase contractor acceptance of higher risk with the promise for higher profits as the reward. A reasonably firm and precise definition of the sesired product is a requirement if the contractor

expects to have a good prospect for higher profit and a high performance evaluation. Placing appropriate emphasis on these factors should serve to deter the contractor from focusing on ways to beat the contract terms to ways and means to promote his own productive efficiency. Moreover if the profit levels were sufficiently attractive and free from public declaimer and if future source selection might be more closely related to past contractor performance, management of defense industry might well be motivated to induce the Department of Defense negotiators into incentive contracts rather than the cost reimbursement types.

It may be that precise contract definition, strong incentive contract with prospective high profits, and performance tied to future source selection could assure well directed efforts from the defense industry.

The Packard Memorandum of 28 May 1970. Although change number eight to the ASPR has strongly endorsed the firm fixed price contract as having essentially an 1/100 profit sharing ratio, the memorandum issue by Deputy Secretary of Defense David Packard on 28 May 1970 effected some changes to this emphasis.[16] Mr. Packard established policy guidance which gave preference to the cost plus incentive contract as being the first choice for advanced development and full scale development for major systems.

When risk can be appropriately managed, a competitive fixed price contract can be let for well defined components and subsystems which in effect partition a program such that competition can be achieved to the maximum extent administratively possible. In cases where risk is being reduced through research and development, fixed price contracting can then be immediately sought. Flexibility in making the contract type decision will be retained with the contracting officer, but in the case of major weapons systems procurement, the final approval of the contracting officers decision rests with the Defense Selected Acquisition Review Council (DSARC).*

Mr. Packard's policy statement encourages the use of negotiated fixed price contracts when effective competition is not available. This negotiation is to be undertaken when development parameters are sufficiently

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*The Defense Selected Acquisition Review Council is a Secretarial level review panel in the Department of Defense set up to make formal review of the progress of an acquisition program at specific milestones or at the termination of the major program phases. (Research, development, prototype production, production are phases.) All major decision points in a program are therefore reviewed by this Council after previous review by all intervening levels of management. The Council Staff is kept continually aware of programs of the selected acquisition programs through periodic reports. Special reports are also made by project managers when unusual cost changes or risk situations become apparent in the performance of a program.

secure to permit a production decision to be made. The policy to seek advertised competitive procurement for well defined subsystems shall be exercised within the negotiated fixed price contract as well.

Letter contracts under this policy statement are to be minimized and change orders* are not to be issued until they have been contractually priced or until a ceiling price has been agreed upon. A restriction on letter contracts does result in a more difficult situation for the procurement of naval ships, as many of these acquisitions are initiated by letter contracts. It is often true that conversion of these contracts to other forms within the 180 day time limitation does not occur in actuality making it difficult to operate under this policy.

Summary. This chapter has presented material designed to point out how the choice of contract form can affect the cost of goods and services to the government. The review suggested some of the faults of the cost plus fixed fee form and traced the development of the cost plus incentive

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*Change orders are those directed modifications to the basic design of a weapon system which generally involves major redesign and production work on the part of the contractor in order to incorporate the change. Change orders may be classed into two categories, mandatory and desirable. If mandatory, the modification is generally accomplished before the system is delivered. If desirable, the change may be documented and accomplished at a later time during an overhaul or modernization period. Change orders are a serious contributor to cost growth and contractor claims against a project.

fee contracts. The incentive contract was discussed in the light of the many bases on which the incentive contract can be structured. The inherent flexibility of design and the variation possible allow the contracting officer the greatest latitude in finding a common ground of beneficial terms to both the government and the contractor.

Problem areas do exist in cost estimation and cost control which affect the profit levels of the contractor and permit him an opportunity to falsify his cost. This problem however exists with all contract forms and is not restricted to the incentive type. It is accentuated with the incentive type. Some discussion was included to portray the industry point of view and contrast the diametrically opposed government point of view on this question. There are many less extreme positions in between, and the uniform cost accounting standards idea is rapidly gaining support such that some form of this requirement will no doubt be soon required by law.

As with all contract types, the incentive contract works best when there are precisely defined specifications, however, when properly drawn with a balance of risk assigned, the contractor can be motivated to attack the problem of

improved system performance rather than profit maximization through reduction in cost alone. This is an extremely important feature of the incentive contract and the performance incentives should be carefully optimized to provide the promise of high profits.

CHAPTER VI

THE IMPACT OF THE CONTRACT FORM ON THE ATTITUDES OF THE PRIVATE SHIPBUILDING INDUSTRY

Introduction. The public and private shipyards are among the important defense industries that are located in the coastal regions of the United States. Representative Charles Bennett of Florida, in addressing the Seapower Subcommittee of the House Armed Services Committee gauged the importance of the industry by fitting the aggregate totals of the various naval and private shipyards against the giant corporations listed in the Fortune Directory of the 500 largest industrial enterprises. He said: " . . . the naval shipyards alone rank about 38th and the shipyards, together with the purchase of new ships and conversions from private yards, rank the Naval Ship Systems Command operations at about enterprise No. 13."[1] This is an important comparison to keep in mind as one considers the management of the various and diverse elements which go together to make this large and many times unwieldy defense organization.

Few industries have compiled the long and enviable records in the days of World War II when the shipbuilding capability of the United States was called upon

to be the shipbuilder for the Allied Powers. It could also be said, partly with tongue in cheek, that few industries appear today in such unchanged form from those tradition-filled days of World War II than the shipyards of this nation. For some, the glamour is wearing thin and for some, the pot appears to be drying up. This chapter will attempt to explore some of these events and suggest some reasons and rationale for the relationships which now exist in the shipbuilding sector of the military-industrial complex. At the outset, it must be acknowledged that this discussion is in no way a complete and all inclusive treatment of the very complex nature of the contracting interface between the Department of Defense (Navy) and the private shipbuilders. Some highlights and trends will be noted as the most significant factors and more complete treatment will be left to the expert in the field.

Beyond acknowledging the important and vital task performed by the ten public Naval Shipyard no further mention will be made of their activity. The need for an indigenous ship repair capability as an integral part of the Naval service will be accepted as fact and the controversy concerning the construction and repair economies in the public and private yards will not be joined. There is an

influence exerted on the private sector by the Naval shipyards in that the division of the repair work available from the Navy is a constant source of concern to private yard management and brings much political pressure to bear on the Navy. This division has been relatively constant for some years at approximately 65% awarded to the Naval shipyards and 35% to the private shipyards.[2] Trends in current time have been to reduce the private yard share due to the smaller quantity of work available and the growing complexity of that repair work. It is predicted that this controversy will continue status quo for some time hence.

A Survey of the Private Yards. There are sixteen major shipyard organizations in the United States which are capable of constructing ships larger than some 600 feet in length and some 80 feet in beam. Seven of these yards are on the East Coast, five on the Gulf Coast, and four to the West.[3] There are no yards on the Great Lakes that are counted in this group although several do exist and have been important in the Navy's new construction programs for destroyer types and smaller craft. Table XV lists the yards and provides some statistical data of importance.

There are a total of 270 private shipyards engaged in shipbuilding and repair work in the continental United States, Hawaii and Puerto Rico. Many of the yards, as implied, are quite small with maximum employment levels of under 100 men. This results in a concentration such that one-third of the shipyards employ almost 90 per cent of the labor force working in the shipbuilding industry.[4]

Figure 7 shows the employment levels for the shipbuilding industry inclusive of Navy and commercial yards, along with the total employment for both categories. From the results of various MARAD studies, it can be generally stated that the larger commercial yards are at employment levels about 60% of that which would provide a maximum efficient peacetime employment level as matched to capabilities of the physical plant possessed by these shipyards.[5] Certainly, many of the smaller yards are at much lower employment levels than 60% and at this time considering the present slump in the commercial shipping, yards without major Navy contracts are operating below 50% of capacity.

Table XVI presents an interesting breakdown of area interest in shipbuilding by employment in coastal regions. This table lists only employment in the private shipyards.

TABLE XVI

TOTAL PRIVATE SHIPYARD EMPLOYMENT BY COASTAL ZONE REGION (FEBRUARY 1970)

NORTHEAST	30,000
MIDDLE ATLANTIC	40,000
GULF	37,000
SOUTHWEST	15,000
NORTHWEST	9,000
GREAT LAKES	9,000
TOTAL	140,000

Source: U. S. Congress, House, Committee on Armed Services, Status of Shipyards: Hearings 91st Congress, 2nd sess., 15 June 1970, pt. I, p. 10072

It can be correctly inferred that the greatest installed capacity for shipbuilding is installed on the East Coast with the Gulf Coast a very close second. There exists only several more positions (shipways or building basins) in the East Coast yards as compared to the Gulf.[6] It can be argued that the Gulf may be ahead in actual productive capacity with the capabilities that are a part of the new Litton Ship Systems Division yard. It will be several years for this claim to come true as that yard will be primarily dedicated to more complex naval construction programs and it is not yet free of development bugs, nor fully staffed.

The new Litton yard represents a facility of the most modern design and concept. The total employment capability of the 'twinned' Litton yards at Pascagoula, Mississippi, i.e. Ingalls Nuclear Shipbuilding Division and the new yard is estimated to reach 16,000 in the later months of 1973.[7] The division will be approximately 5000 employees at the older facility on the east bank and 11,000 at the new yard on the west bank. These figures will increase Gulf Coast employment in shipbuilding to about 48,000 by 1973 assuming that there will be no major reductions at any of the remaining Gulf Coast yards. With slightly lower wage rates than the remainder of the U. S. shipbuilding industry and with self-sustaining capabilities,* the long term growth of shipbuilding along the Gulf Coast is well assured.

In the East, the large shipyard of the Newport News Shipbuilding and Dry Dock Company in Newport News, Virginia operates with sustained employment of about 22,000,** about 70% of facility capacity.[8] The mix between defense

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*Self-sustaining capability is considered to mean that the shipyard is capable within its own plant to manufacture all the necessary components to build a ship. The only yard with true self-sustaining capabilities is the Avondale Yard at Westwego, La. The other yards must depend upon other firms as suppliers for major subsystems such as shafting and propellors, turbines, gears, etc. It is very seldom that a shipyard operates in a self-sustaining mode and it refers largely only to capability.

**In terms of employment, the Newport News Shipbuilding and Dry Dock Company is the largest shipyard in the United States.

and commercial business is currently about 80/20 favoring the defense work.[9] This yard is significant in that it has specialized in the nuclear powered aircraft carrier such that it is the sole supplier to the Navy of these important vessels. As a nuclear qualified shipyard, Newport News has the capability to construct all sizes of nuclear powered surface vessels and submarines. There are two other shipyards with this capability, General Dynamics Corporation with surface capability at Quincy, Massachusetts and submarine capability at Groton, and Litton Industries with submarine capability at the Ingalls Nuclear Division at Pascagoula, Mississippi. Thus three East Coast yards and one Gulf Coast yard have nuclear qualifications which could extend to commercial vessels.

Bethlehem Steel Corporation operates eight facilities (five on the East Coast, one on the Gulf Coast, and two on the West Coast), the only one of which dedicated to shipbuilding is the Sparrow's Point, Maryland yard. There is a new building basin at this yard, the largest in the United States, measuring 1200 feet by 200 feet by 27 feet deep for the construction of large tankers and bulk carriers.[10] Bethlehem's management is phasing out of defense work, having in 1963 divested themselves of the Quincy, Massachusetts yard (now owned and operated by General Dynamics) and having recently completed work on two ammunition

replenishment ships. The remainder of the activity in shipbuilding by Bethlehem is concentrated in tankers and bulkers along with barges and of course, repair of commercial vessels.

The Maryland Shipbuilding and Dry Dock Company is engaged entirely in commercial ventures, primarily repair and conversions of merchant vessels. Some Navy work involving overhauls of minecraft and auxiliary vessels has been placed with this yard, but recently there has been little work of significance.

Sun Shipbuilding does not currently have any Navy new construction work and is not actively seeking any but logistic ships, of the type used in Military Sea Transportation Service charter service. Sun has an innovative management group and has embarked upon some uniquely successful programs involving the construction and operation of unusual ship types such as the William Callaghan, the gas turbine powered roll-on roll-off ship chartered to MSTS.

General Dynamics Corporation operates two yards in the Northeast Region, one at Groton, Connecticut devoted exclusively to the construction and conversion of nuclear powered submarines, and one at Quincy, Massachusetts for surface work. General Dynamics is an active seeker of

Navy work and has adequate backlog at Groton. The surface operation at Quincy is less active and the Navy programs there are drawing to a close with nothing as yet on the order book from the defense sector. Quincy is looking to commercial work to fill the gap in activity at this time.

In the far Northeast, Bath Iron Works represents a long association with the Navy in the construction of destroyer and destroyer leader type ships. These ships have a reputation for quality and Bath is a strong contender for ships in this category. Currently, Bath, having lost the bid to achieve the 30 ship DD-963 destroyer contract, is looking toward commercial work to maintain operations when the destroyer leader modernization program completes later in 1972. Bath will be a strong competitor for later Navy contracts involving small combatants.

In the West, matters are particularly bleak. Todd Shipyards and Lockheed Shipbuilding and Dry Dock Corporation have all but completed the Navy work in their West Coast facilities and National Steel will soon complete the construction of a multi-year run of tank landing ships. Both Navy and commercial work on the Pacific Coast does not hold promise for immediate relief and all yards are in need of new business.

The concentration of work is centered in the Gulf Coastal region with Avondale Shipyards and the two Litton Yards holding the greatest share. Avondale is completing a multi-year contract for destroyer escort vessels with nine more to be delivered. In addition, there are several commercial projects for Lash ships which will provide work for several years more. With the exception of the Ingalls Nuclear Division, Litton has sufficient work to last well beyond the mid 70's with the landing assault ship and the DD-963 destroyer acquisition.

Almost all of the shipyards mentioned do need and are depending strongly on the MARAD program to provide them work during the 1970's. The Navy, even though additional monies are being devoted to shipbuilding, is facing the problem of fewer numbers of more complex ships. This of course translates into higher expenditures but fewer yards and fewer ships with a high percentage of the procurement dollar going into subsystems. Certainly one positive effect to the MARAD program will be to insure a level employment for the period and hopefully, there will be some stimulation for capital improvement.

Shipyard Modernization and Capital Investment. In the American shipbuilding industry, major capital investment to promote modernization of facilities and techniques has become

a problem for government out of concern for the industrial mobilization base, the condition of the U. S. flag merchant fleet, and the cost of shipbuilding, both commercial and naval. In the words of a manager of one of the major shipyards: "Our plans for future investment in the shipyard are viable and will be commensurate with the business opportunities available."[11] This statement is suggestive of the industry wide attitude with regard to modernization and it is of course quite rational and businesslike. Only if the economic activity will permit a reasonable return to be expected from the capital investment, will that improvement be made. It has been implied that many yards require relatively large transfusions of capital to renew equipment and improve upon the production process. General Dynamics made capital investments of $23 million in the Quincy facility to achieve a more modern plant before commencing operations in 1964.[12] Improvements such as these do indeed help to reduce cost by promoting efficiencies however due mainly to process bottlenecks which are often extremely expensive to remove, full efficiency is seldom achieved.

Figure 8 outlines the overall capital expenditure in the shipbuilding industry. A positive trend in the period 1966 to 1969 is largely attributable to the $130 million

expended by Litton on the new Pascagoula Yard. Newport News Shipbuilding and Dry Dock has expended some $69 million per year since 1958. Bethlehem Steel has an expansion and improvement program underway which when complete will invest $50 million. Todd Shipyards have invested some $4 million per year for the past ten years. These are significant figures and they are also the most active yards among the U. S. shipyards as seen from the order book. All other yards are not without plant improvement plans, but they are without the motivating capital to undertake these plans.

Unfortunately, in some cases the small periodic expenditure can accomplish little more than staving off near obsolescence rather than making the sweeping renovation necessary for sizable progress.

The modernization program envisioned by Bath Iron Works in conjunction with their competition for the DD-963 destroyer program was to cost approximately $64 million.[13] It was planned to build new production facilities for the construction of the 30 destroyers. This program was not undertaken as the contract was lost, but it points out the importance of the backlog of work to the shipyard manager as it influences his decision to expend capital for modernization. A similar though not as extensive plan is envisioned for Bath based upon the number of MARAD ships

that are built there.[14] This program is very important because of the relatively low risk involved in the construction of these ships.

It is reasonably clear that in the recent past, and certainly for the present and foreseeable future, the private shipbuilding sector will be unable to modernize or construct new yards to replace the old plants unless major government participation provides the necessary market conditions.

Government action must be scaled such that sufficient market opportunity is developed in order to motivate shipyards to make the needed significant improvements. A contract clause stating a requirement to present physical and financial plans for improvements design to reduce the end cost of the product may be implemented. This strategy is integral with the Maritime Administration's program and in the Navy's total package procurement acquisitions for the landing assault ships (LHA) and the DD-963 destroyers. This incentive is also available through multi-year contracts for large production runs of standard ships. Further, when the contract definition process can be followed, there is an opportunity for the contractor to adapt

the design to his production facilities and apply the most effective modernization to his production processes.

In summary, Mr. Ed Hood of the Shipbuilders Council of America, in a statement before the Seapower Subcommittee reflected on the situation:

> If, on the one hand, the industry has opportunities to build only one or a few ships at a time with little prospect of future orders, shipyards must, perforce, undertake to build a limited number of ships within the immediate framework of existing facilities.
>
> In this case, there is no prospect of amortizing new capital investment beyond the immediate, and short term, workload. This inhibition has been a characteristic of most merchant shipbuilding contracts during the past two decades.
>
> On the other hand, the volume/rate of delivery demands of a particular contract may dictate major expansion of existing facilities. These kinds of contracts stimulate considerable innovative improvements in techniques as well as facilities, and also enable volume production at optimum costs.
>
> The Navy's 17-ship LST contract of 1966, 20-ship DE contract of the same year, 9-ship LHA contract of 1969 and 30-ship DD-963 contract awarded only last week are appropriate examples. Each has or will sustain substantial capital investment in new or modernized plants.[15]

While a rather exhaustive quotation, it covers very well the motivating factors necessary to achieve meaningful modernization.

Contracting in the Shipbuilding Industry, Some Viewpoints. The current most controversial topic concerns the Navy's single source procurement for the acquisition of the 30 destroyers in the DD-963 program. In an address before the Society of Naval Architects and Marine Engineers in 1970, Mr. J. J. Henry, President of the Society remarked:

> Without a doubt this* is one of the most controversial actions by the DOD in several years and was pursued and put into effect without regard to lessons of recent history and in the face of recommendation of the Blue Ribbon Panel in their report of July 1, 1970 to the President and the Secretary of Defense.
>
> Its major premise is the savings in costs obtained by purchasing from a single source of a large number of identical units. Evidence is already beginning to accumulate that there will be no such savings and the possibility of purchasing the same unit without change over a period of years is completely unrealistic.[16]

Mr. Henry went on to discuss the advantages of maintaining a broadly based industry to encourage flexibility, competition, and ingenuity in the design and production of ships. He pointed out the extreme danger of losing the management know how and skills of those yards which will slowly atrophy under this procurement policy.

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*Mr. Henry is referring to the procurement of the 30 destroyers in the DD-963 project from a single shipbuilder.

Mr. Henry is quite correct in the view that spreading the contracts out in small ship lots did develop a broadly based industry, but it did not, as has been indicated, bring to fruition the kind of ingenuity in technique and investment in capital improvements which are also essential to the maintenance of a viable industry.

The adverse impact on the shipbuilder who loses out on the multi-year or total package procurement contract is an accepted fact. The deleterious effect on the mobilization base is also noted. The fact must be squarely faced however, that the Navy and the Maritime Administration are both convinced that the best way to build ships is to do so in reasonable numbers of standard design. This translates directly into lower costs per unit and more defense and a better merchant marine for the dollar.

Assistant Secretary of the Navy Frank Sanders described the above mentioned factors as well as the geographical dispersion of the contract dollars as a definite weakness of the procurement. He did list the important pros of the policy as being the standardization possible through a single source procurement, the market reduction of the logistics support problems that such standardization permitted, and most importantly, the cost was less. . .estimated at the time to be on the order of $600 million lower than the competitor's price.[17]

The argument which questions the geographical concentration of such single-source contracts, though valid as far as the actual construction and systems integration and test are concerned, is not extremely effective when the subcontracting pattern is studied. It has been shown that some 60% of the DD-963 contract value will be subcontracted. This is, of course, more true of Naval vessels than commercial ships because of the number and complexity of the subsystems involved. In two other procurements, the landing assault ship (LHA) and the destroyer escort (DE-1052) class, 57.3% and 56% respectively, of the contract value was subcontracted inclusive of the government furnished material.[18] The natural effect of this wide subcontracting is to gain the geographic dispersion that is necessary to infuse industrial strength.

What is of real concern in this matter, is the reduction in incentive to the industry as a whole because of the heavy investment necessary to compete in the concept formulation/contract definition process. Not all procurements will be made in this manner, however, and opportunities for the independent naval architects and the balance of the industry will still exist. There will be fewer of these opportunities based upon the need the Navy has to achieve

the most defense from the dollars available. It is also true that a controversy exists over the concept formulation/contract* definition process regarding the duplication of effort of several independent contractors working in competition. Shipbuilders are concerned largely about the expense, and this has led them to point up to the Congress as many possible faults as might be found.** By characterizing the process as wasteful, the attention of the Seapower Subcommittee members was quickly acquired. While there is duplication of effort, there is seldom duplication of ideas and much technical transfusion is feasible from the use of this procurement strategy.[19] The government is capable of taking several good concepts and integrating them to achieve what is desired. Certainly to do this requires complicated

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*Concept formulation/contracts definition, simply defined, is that term applied to a procurement strategy in which multiple suppliers are invited to compete for a contract by providing a complete design to performance parameters supplied by the Navy. Of the many designs prepared, several are chosen to go under contract competitively to develop detail specifications and production plans in the contract definition phase. A winner is eventually chosen after the contract definition phase. The competing firms are required to supply their own capital to compete in the concept formulation stage, a point which causes the risk assessment in this procurement strategy to be carefully looked at by the contractors. An important advantage of this technique is the ability of the contractor to tailor his design to his production facilities.

**Of the six shipbuilders competing in the DD-963 concept formulation phase, all were preparing their proposals on company funds. Costs varied, but were, on the average, about $2 million per proposal.

contractual procedures which must be drawn up to utilize only segments of a design. While the situation depicted may not ever become reality, it is nevertheless, an alternative which serves to point up the fact that all the work is not a waste and several technical approaches may have value.

The majority of the shipbuilders feel that in the current major procurements, the Navy has not acted wisely in establishing a ship acquisition system which will project inth the future (10 years) with the end product still being the standard ship which was originally sought. Critics point out that there will be numerous developments of a technical nature which if not fitted out during the building, will cause the ship to be obsolete at the time of delivery, ergo the ship will not be delivered as a standard ship but will be greatly modified. Furthermore, the eventual loss of cost control on the project is predicted and the ensuing cost over-run will easily negate any anticipated saving that the Navy had originally projected under the system.

It is the Navy position that the line can be held against over-runs and standardization can be achieved. Modernization will then be effected through later overhaul and alteration procedures. A further argument made by the

Navy is that lead time for many equipments, in particular such items as propulsion gears, turbines, major pumps, air compressors, etc., is such that the construction program cannot be accelerated through parallel activity in several shipyards due to the delivery schedule of these equipments. Should parallel construction plans be implemented, standardization could not be applied as several proprietary sets of major components would have to be purchased for installation. Again, no two yards could build the same ship.

To sum the views of the major shipbuilders is to say that they perceive the advantage in the procurement game to be currently with the Navy. With few exceptions, they view the profit performance in the past as extremely poor, and under the major forces acting in the procurement arena currently, the potential for the future is not considered very rosy. Because of the program of the Maritime Administration for the 1970's, shipbuilders view the future with guarded optimism. The Navy will also be acquiring ships with renewed vigor as several new programs under consideration for smaller, less complex, and therefore less expensive ships in larger numbers may soon come to fruition in the mid 1970's. It is likely that following concept formulation, the leading design will be placed with several shipbuilders for the contract definition stage and ensuing production.

Management Trends in the Shipbuilding Industry. It is an observation of this paper that the management patterns of the major shipyards have been undergoing changes in the past decade, changes which have in part been due to the contracting policies of the Department of Defense (Navy). The new procurements stress new management techniques, advanced program planning and control, and the interdisciplinary organization of project teams and industrial talent.[20] In many ways, these techniques are not traditional to the management practices of the shipbuilders as they emerged from the confusion of World War II. The Navy, in response to the requirements of the contracting policies instituted by the Department of Defense in the McNamara era has designed procurements which require a specific management technique from the contractor, particularly in the design and production planning stages for a ship construction project. This has led not only large management oriented corporations to seek shipyards to apply their management expertise, but it has also made the shipyards receptive to mergers and purchase plans.

The result has been a progressive growth of the conglomerate management group overseeing and controlling the operation of the shipyard or shipyards. Some examples of this trend may be found by examining the major yards and

reviewing the management history. Bath Iron Works, once a privately owned and controlled shipyard, is now a part of Bath Industries, a diversified conglomerate. Litton Industries, a diversified conglomerate, acquired the Ingalls Shipbuilding Division in 1961 and as has been noted, completed construction work on their new facility at Pascagoula in 1971. The Ogden Corporation maintains management control of Avondale Shipyards and National Steel and Shipbuilding Company is owned by a consortium of Kaiser Industries and the Morrison-Knudsen Company. In the latter case, management control is vested with the Kaiser Engineers Division of Kaiser Industries. The Bethlehem Steel Corporation, though not technically a conglomerate, nevertheless is one of the industrial giants which incorporated a Shipbuilding Division.

There are of course, many other reasons for the conglomerate takeover than that of management expertise which such a merger would be expected to provide. The acquisition of the Quincy Shipbuilding Division by the General Dynamics Corporation and the Puget Sound Shipbuilding and Dry Dock Company by the Lockheed Aircraft Corporation are cases in point. It is probable that in these situations, the primary reason for these acquisitions was a desire to diversify within the defense and commercial industry.

Newport News Shipbuilding and Dry Dock Company was acquired by Tenneco in 1968. The first move that this parent organization made was to introduce new management to the company. Mr. L. C. Ackerman, President of the Shipyard commented on this to the Seapower Subcommittee. His comments are very descriptive and appropriate for a consideration of the management attitude of the conglomerate. He said, regarding his experience in the shipbuilding industry: " . . . I found that many management people in the shipbuilding industry certainly knew the bow (of a ship) from the stern, but didn't know a debit from a credit."[21] As to the results which are sought from the management changes, he said:

> . . . it is my obligation to insure that Newport News Shipbuilding and Dry Dock Company makes a profit. This is not an obligation just to the management of Tenneco, or the stockholders. For without a profit, the shipyard will no longer serve its customers, not our suppliers, not our community.
>
> But just making a profit is not enough in this day of extreme competition for investment money. We must realize in the shipbuilding business an adequate return on our investment. If a competitive return is not generated, we will not be able to attract, or even hold, the needed capital.
>
> It is absolutely necessary that we clearly see a reasonable opportunity for a competitive profit before we make the extremely large investment required to move shipbuilding from a labor intensive to a capital intensive industry.[22]

And that pretty well sums up the situation.

CHAPTER VII

CONCLUSIONS

On the Military-Industrial Complex. An obvious conclusion is that there definitely exists a framework of common interest and association between defense and industry which is termed the military-industrial complex. This framework is basically welded together by the profit motive (however small) in industry and the continual optimism in the military that development is underway which will produce the best weapon system for the money. The structure is aided and abetted by industrial and military associations which provide unofficial and official contact for the dissemination of public information and business purposes. Prominent people in these organizations serve as influence transfer mediums between groups and the Congress. This is an important role and can be viewed as both harmful and helpful depending upon one's point of view.

The military-industrial complex is not a design to usurp funds from the government to be channeled into programs with concomitant waste. Such claims are largely based upon emotionalism and a quest for public sympathy and attention. Industry, with public relations expertise can counterattack the opinion generated by these claims but the government appears shallow in the permitted protestations.

It is further concluded that the nation is not far from the day when there will be a series of industry government links in practically every area of public interest. These form as a contractor perceives funding and he examines his firm's talents against the requirement of the government. He may be successful in his bid and as long as there are funds available in that program, the government people must contract for services, reprogram or lose the funds. The combination of contractor interest and government willingness serves to ensure that the funds will be spent. It is also true that with normal attentiveness, project managers will have sufficient opportunity to discover many useful ways that funds may be utilized. This is not to be critical of the program with the priority of the moment, however, upper level management must exercise more complete control over priorities in all areas of interest.

On the Contract Interface. The contract does indeed define the legal rules for the interface between the contractor and the Department of Defense. This has been a highly dynamic relationship over the past several decades as management on both sides has shifted position to examine the behavior of his counterpart in relation to the terms of the contract. This paper is not suggesting which came first, in absolutes, management sophistication or contract sophistication, however,

it seems generally to be true that the industrial sector held the lead until the McNamara years when rapid change in the Department of Defense policies caused reaction on the part of the defense contractors.

It is concluded that the incentive contract is a powerful instrument and is a technically correct way to develop the best features of the defense-industrial interface. Because it is a sophisticated instrument with respect to its design, it must be carefully crafted to exploit the best interest of each party.

On the Contract and the Shipbuilding Industry. The 1960's saw the conglomerate move into the shipbuilding industry. It is interesting to speculate why this is so. Many avenues of thought are available, however, one which appears to be substantiated is the obvious management deficiencies which much of the industry exhibited following World War II. The challenge to modern, enlightened management is thought to be a central reason for the entry of the conglomerate into the shipbuilding business. The Navy has found tougher bargaining and a tightening of the contractor's attitudes with respect to contract interpretation. The normal adversary relationship appears to be somewhat more strained. This management change has brought one new shipyard into being and introduced some new capital into older shipyards to keep them on the competitive margin. These are certainly

healthy signs.

The total result of the new management practices is not yet clear. The rather traditional and labor intensive nature of the shipbuilding industry represents a high inertia target for the systems approach and the aviation styled management practices. It would seem that in the next half decade, the more traditionally minded shipyards will be carefully observing the effects of the new systems, ready to adopt any or all that are effective.

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APPENDIX I

TABLES AND FIGURES

TABLE II

RANGE OF CONTRACT TYPES, WITH THEIR THEORETICAL ADVANTAGES AND DISADVANTAGES

Firm-fixed-price

Application:	Where fair and reasonable price can be established at outset. For example, where there are: reasonably definite design or performance specifications, realistic estimates, adequate competition, valid cost or pricing data providing reasonable price comparisons, and/or reasonable allocation of risks.
Advantages to government	Shifts total risk to contractor. Minimum administration. Simplifies budgeting. Some degree of price competition. Uniformity for bid evaluation. Contractor responsible for management. Well-defined work statement and specifications.
Disadvantages to government	Presolution of design problems. Price must contain contingencies. No in-process control of work. Less visibility of cost data. Complete formality for changes.
Advantages to contractor	Potential for higher profit. Minimum government control. Well-defined specifications; better cost estimates. Less financial audit.
Disadvantages to contractor	Total assumption of financial and technical risks. Risk of loss liability for work in process. Requires vigilance to institute change claims. Government does not accept cost contingencies.

TABLE II
(Continued)

Fixed-price with escalation	
Application:	Where market or labor conditions are unstable over extended production period. Where contingencies must be identified and covered separately by escalation.
Advantages to government	May result in downward adjustments. Contractor responsible for management.
Disadvantages to government	Increased administrative costs. Poor choice of index distorts.
Advantages to contractor	Spreads risk.
Disadvantages to contractor	Contains absolute ceiling. Poor choice of index distorts. Escalation limited to industry-wide contingencies. Contingencies within contractor control excluded.
Fixed-price-incentive (cost only)	
Application	Where cost uncertainties exist and there is the possibility of cost reduction and/or performance improvements by giving contractor (a) a degree of cost responsibility and (b) a positive profit incentive.
Advantages to government	Spreads risk. Less reason for contingencies in price. Encourages efficiency. Contractor responsible for management. No ceiling on incentive for efficiency.
Disadvantages to government	No ceiling on profit. Increased administrative costs. Must budget to ceiling price. Minimum control of work in process. Complex negotiations. Precludes technical direction. Limits technical innovation.
Disadvantages to contractor	Price ceiling. Detailed accounting records. Government verification of costs. Complex negotiations. Government tends to treat as cost type contract controls, cost principles, and so forth.
Advantages to contractor	Potential for higher profit for higher risk. Rewards good management. Less government control.

TABLE II
(Continued)

Fixed-price multiple incentive

Application	Where improved performance desired.
Advantages to government	Motivates contractor to surpass performance targets.
Disadvantages to government	Complex administration. May increase costs. Unbalanced incentives may result in undesirable trade-offs. Contract must be specific.
Advantages to contractor	Spreads cost and profit risk.
Disadvantages to contractor	Incentive measurements may be inaccurate. Delays in profit determination. Changes difficult to administer.

Fixed-price redeterminable

Application	For quantity production-where realistic price can be negotiated initially but not for later period(s) of performance.
Advantages to government	High possibility of downward adjustment.
Disadvantages to government	Little motivation for cost reduction. Prompt price redetermination required. Prospective pricing period must conform to contractor's system. Not used until after negotiation of firm fixed price not satisfactory.
Advantages to contractor	Reduces risk.
Disadvantages to contractor	May include absolute ceiling. More detailed accounting records. Government verification of accounting records. High possibility of downward adjustment.

TABLE II
(Continued)

Cost	
Application	Where performance is uncertain and reasonable cost estimates impossible.
Advantages to government	No fee.
Disadvantages to government	No motive to reduce cost. Government partially responsible for management.
Advantages to contractor	Minimum risk.
Disadvantages to contractor	No fee.
Cost-sharing	
Application	Where development of research projects is jointly sponsored by government and contractor, and there is a high probability of commercial benefit.
Advantages to government	No fee. Bears only portion of cost. Motivates for cost reduction.
Disadvantages to government	Limited to certain R&D cases. Limits competition. Must show conclusive evidence of probability of commercial benefit.
Advantages to contractor	Government participation in commercial development.
Disadvantages to contractor	Cost share may be excessive.

TABLE II
(Continued)

Cost-plus incentive fee

Application	For development and test when incentive formula can provide incentive for effective management. Where feasible, performance incentives used together with cost and schedule incentives.
Advantages to government	Shared risk. Motivates for cost effectiveness through bonus-penalty arrangement. Shares in-process control of work. Limited price contingencies. Cost visibility.
Disadvantages to government	Overrun costs. High administrative costs. Complex negotiations. High risks. Reduced opportunity to manage.
Advantages to contractor	Limited risk. Possibility of increased fee, Assures recovering costs. Rewards good management.
Disadvantages to contractor	Reduced fee because of reduced risks. Absolute limit on fee. Disallowance of certain normal business costs. Government engagement. Complexity of negotiations.

Cost-plus-multiple-incentive-fee

Application	Where performance objectives are determined and development is probable. Appropriate for major systems development.
Advantages to government	Establishes relative value of cost, performance, and schedule. Motivates for superior performance; achievement.
Disadvantages to government	Unbalanced incentive may result in undesirable trade-offs. Complex administration.
Advantages to contractor	Spreads cost and profit risk. Incentive trade-off decisions.
Disadvantages to contractor	Incentive measurement may be inaccurate. Delays in profit determination. Changes difficult to administer.

TABLE II
(Continued)

Cost-plus-fixed-fee

Application	Where performance is uncertain and accurate cost estimates are impossible. For research or other development effort when the task or job can be clearly defined, a definite goal or target expressed, and the specific end product required.
Advantages to government	Control of delivery schedule. Ease of governmental redirection of effort. Maximum control of work. Emphasizes performance objectives.
Disadvantages to government	Low motivation for cost efficiency. High risk. Not for development of major weapons once exploration indicates engineering development feasible. Maximum administrative burden. Funding uncertainties. Settlement of final costs is prolonged.
Advantages to contractor	Low cost and technical risk. Risk of loss of government property borne by government.
Disadvantages to contractor	Maximum government controls and reporting. Disallowance of certain normal business costs. Lower fees because of lower risks.

Source: Hudson B. Drake, "Major DOD Procurements at War with Reality," Howard Business Review, January - February 1970, p. 119 - 140.

TABLE III

NET CHANGES IN DEFENSE SPENDING AND EMPLOYMENT AS CONTRASTED WITH OTHER FEDERAL AND STATE AND LOCAL SPENDING AND EMPLOYMENT

	FY 1964 to FY 1968	FY 1968 to FY 1972	FY 1964 to FY 1972
Change (Current dollars in billions)			
Defense spending	+27.2	- 2.0	+25.2
Other federal spending	+34.8	+55.5	+90.3
State & Local spending	+36.2	+53.7	+89.9
Change (Constant FY1972 dollars in billions)			
Defense spending	+24.1	-23.9	+ 0.2
Other Federal spending	+31.9	+36.4	+68.3
State & Local spending	+29.6	+29.0	+58.6
Public Employment(x 10^3)			
Defense (includes Military)	+1,114	-1,247	- 133
Other Federal	+ 230	+ 149	+ 379
State & Local	+2,229	+1,849	+4,078
Total Public Employment	+3,573	+ 751	+4,324
Total Labor Force (x 10^3)			
Defense[a]	+2,232	-2,508	- 276
All Other	+4,542	+8,951	+13,493
Total Labor Force Change[a]	+6,774	+6,443	+13,217

[a]Includes military personnel, civilians employed in the United States, and defense related employment in the United States' industry.

Source: Statement of Secretary of Defense Melvin R. Laird on the Fiscal Year 1972-76 Defense Program and the 1972 Budget, Toward a National Security Strategy of Realistic Deterrence, (Washington, 1971), p. 171.

TABLE IV

PRIME MILITARY CONTRACT AWARDS 1960-1967 TO TOP 25 U.S. COMPANIES FOR FIRMS TOTALING MORE THAN $1 BILLION IN THIS 7-YEAR PERIOD (IN MILLIONS OF DOLLARS)

Contractor/Ranking	FISCAL YEAR							7-Yr. Total	% of Total Sale
	1961	1962	1963	1964	1965	1966	1967		
1. Lockheed Aircraft	1,175	1,149	1,517	1,455	1,715	1,531	1,817	10,619	88
2. General Dynamics	1,460	1,197	1,033	987	1,179	1,136	1,832	8,824	67
3. McDonnell Douglas	527	779	863	1,360	1,026	1,001	2,125	7,681	75
4. Boeing Company	920	1,133	1,356	1,365	583	914	912	7,183	54
5. General Electric	875	976	1,021	893	824	1,187	1,290	7.066	19
6. No. American Rockwell	1,197	1,032	1,062	1,019	746	520	689	6,265	57
7. United Aircraft	625	663	530	625	632	1,139	1,097	5,311	57
8. American Tel. & Tel.	551	468	579	636	588	672	673	4,167	9
9. Martin-Marietta	692	803	767	476	316	338	290	3,682	62
10. Sperry-Rand	408	466	446	374	318	427	484	2,923	35
11. General Motors	282	449	444	256	254	508	625	2,818	2
12. Grumman Aircraft	238	304	390	396	353	323	488	2,494	67
13. General Tire	290	366	425	364	302	327	273	2,347	37
14. Raytheon	305	407	295	253	293	368	403	2,324	55
15. AVCO	251	323	253	279	234	506	449	2,295	75
16. Hughes	331	234	312	289	278	337	419	2,200	a
17. Westinghouse Electric	308	246	323	237	261	349	453	2,177	13
18. Philco-Ford	200	269	228	211	312	440	404	2,064	3
19. RCA	392	340	329	234	214	242	268	2,019	16
20. Bendix	269	286	290	257	235	282	296	1,915	42
21. Textron	66	117	151	216	196	555	497	1,798	36
22. Ling-Temco-Vought	47	133	206	247	265	311	535	1,744	70
23. International Tel. & Tel.	202	244	266	256	207	220	255	1,650	19
24. IBM	330	155	203	332	186	181	195	1,583	7
25. Raymond International[b]	46	61	84	196	71	548	462	1,568	a

[a] Data is not available. [b] A consortium of Morrison-Knudsen, Brown & Root and J.A. Jones Construction Company.

Source: James L. Clayton, ed., The Economic Impact of the Cold War (New York: Harcourt, Brace & World, 1970), p. 44.

TABLE V

DEFENSE CONTRACT AWARDS AND PAYROLLS-STATES, 1965-1967 (DOLLARS IN MILLIONS)[a]

State	1965 Annual Contract Awards[b]	1965 Estimated Annual Payroll Mil.[c]	1965 Estimated Annual Payroll Civ.[d]	1966 Annual Contract Awards[b]	1966 Estimated Annual Payroll Mil.[c]	1966 Estimated Annual Payroll Civ.[d]	1967 Annual Contract Awards[b]	1967 Estimated Annual Payroll Mil.[c]	1967 Estimated Annual Payroll Civ.[d]
Total (all states)	26,631	7,781	6,774	35,713	8,432	7,212	41,817	9,350	8,044
Alabama	165	130	228	282	155	233	297	184	233
Alaska	74	138	57	72	155	52	86	166	56
Arizona	177	105	48	248	111	52	250	139	61
Arkansas	39	54	29	96	55	29	127	58	33
California	5,154	983	1,046	5,813	1,099	1,189	6,689	1,150	1,328
Colorado	250	163	100	256	188	106	210	223	116
Connecticut	1,180	23	23	2,052	18	27	1,936	20	32
Delaware	38	43	8	37	41	9	52	50	10
Dist. of Col.	244	142	230	328	192	191	358	186	209
Florida	633	362	166	767	361	189	799	384	213
Georgia	662	396	224	799	437	259	1,148	532	287
Hawaii	72	183	121	64	181	155	65	176	171
Idaho	12	31	3	20	25	3	15	22	4
Illinois	422	219	200	920	245	205	1,064	304	221
Indiana	605	41	83	1,068	49	97	898	52	116
Iowa	134	8	4	248	8	5	279	9	6
Kansas	229	173	32	313	154	34	399	179	40
Kentucky	43	172	79	70	201	95	124	289	109
Louisiana	256	128	44	303	170	47	656	199	57
Maine	69	65	10	51	64	11	57	61	13
Maryland	584	254	343	843	256	326	870	327	366

TABLE V
(Continued)

State	1965 Annual Contract Awards[b]	1965 Estimated Annual Payroll Mil.[c]	1965 Estimated Annual Payroll Civ.[d]	1966 Annual Contract Awards[b]	1966 Estimated Annual Payroll Mil.[c]	1966 Estimated Annual Payroll Civ.[d]	1967 Annual Contract Awards[b]	1967 Estimated Annual Payroll Mil.[c]	1967 Estimated Annual Payroll Civ.[d]
Massachusetts	1,179	153	172	1,336	161	184	1,422	139	193
Michigan	533	105	83	918	105	90	1,034	104	103
Minnesota	260	24	13	498	26	15	651	26	18
Mississippi	152	105	42	162	131	46	115	143	50
Missouri	1,061	104	114	1,113	152	143	2,278	178	166
Montana	69	50	6	14	54	8	78	57	10
Nebraska	43	101	25	80	90	28	103	83	30
Nevada	19	40	18	32	36	20	29	37	19
New Hampshire	52	41	62	110	36	60	163	29	65
New Jersey	820	166	171	1,090	217	181	1,235	227	243
New Mexico	84	111	75	86	94	80	80	96	88
New York	2,229	174	342	2,819	183	282	3,262	168	313
North Carolina	288	344	63	449	373	77	448	439	87
North Dakota	49	59	8	83	70	9	17	76	9
Ohio	863	111	333	1,589	133	321	1,603	135	354
Oklahoma	120	161	169	158	176	196	157	210	226
Oregon	40	26	23	90	23	24	99	20	25
Pennsylvania	989	77	510	1,665	78	511	1,649	77	528
Rhode Island	86	38	56	132	44	64	198	44	71
South Carolina	82	185	99	176	263	117	181	243	130

TABLE V
(Continued)

State	1965 Annual Contract Awards[b]	1965 Estimated Annual Payroll Mil.[c]	1965 Estimated Annual Payroll Civ.[d]	1966 Annual Contract Awards[b]	1966 Estimated Annual Payroll Mil.[c]	1966 Estimated Annual Payroll Civ.[d]	1967 Annual Contract Awards[b]	1967 Estimated Annual Payroll Mil.[c]	1967 Estimated Annual Payroll Civ.[d]
South Dakota	21	34	9	23	37	9	9	38	10
Tennessee	197	90	45	502	91	44	538	90	49
Texas	1,447	798	399	2,292	938	448	3,547	1,068	515
Utah	191	24	139	170	27	170	179	28	203
Vermont	32	2	0	81	2	1	100	1	1
Virginia	473	444	540	426	476	570	665	590	623
Washington	546	211	157	444	203	174	606	250	197
West Virginia	90	3	7	149	3	8	140	3	9
Wisconsin	203	22	12	365	20	15	384	17	23
Wyoming	8	25	4	11	25	4	33	24	5
Undistributed	3,363	140	0	4,000	0	0	4,435	0	0

[a] Data for contracts refer to awards made in the Fiscal Year specified; expenditures relating to those awards may extend over several years.

[b] Awards of $10,000 or more for supplies, services and construction. Figures reflect impact of prime-contracting on State distribution of defense work. Often the State in which a prime contractor is located is not the State in which the subcontracted work is done

[c] For shore based personnel only.

[d] Direct hire employees only.

Source: James L. Clayton, ed., The Economic Impact of the Cold War (New York: Harcourt. Brace & World, 1970), p. 32-33.

TABLE VI

NET PROFIT AFTER TAXES AS A PERCENT OF SALES: A COMPARISON OF THE DEFENSE INDUSTRY WITH OTHER MANUFACTURING CORPORATIONS IN DIFFERENT SECTORS OF THE ECONOMY 1957 THROUGH 1964

YEAR	ALL MANUFACTURING[a] CORPORATIONS	NON DURABLE GOODS	DURABLE GOODS	DEFENSE INDUSTRY
1957	4.8	4.9	4.8	2.9
1958	4.2	4.4	3.9	2.4
1959	4.8	4.9	4.8	1.6
1960	4.4	4.8	4.0	1.4
1961	4.3	4.7	3.9	1.8
1962	4.5	4.7	4.4	2.4
1963	4.7	4.9	4.5	2.3
1964	5.2	5.4	5.1	2.6

[a]The newspaper industry is not included.

Source: Aerospace Industries Association, 1965 Aerospace Facts and Figures, (Aerospace Industries Association of America, Inc. 1965), p. 17.

TABLE X

DEFENSE AWARDS BY TYPE OF CONTRACTING PRICING PROVISION FISCAL YEARS 1955-1965

Type of Pricing Provision (Per Cent)	Fiscal Year										
	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965
Firm Fixed Price	39.7	36.4	35.3	27.8	32.8	31.4	31.5	38.0	41.5	46.3	50.7
Fixed Price Incentive	22.9	19.2	17.8	19.2	15.3	13.6	11.2	12.0	15.8	18.5	23.7
Cost Plus Incentive Fee	1.4	1.9	1.2	3.2	3.2	3.2	3.2	4.1	11.7	14.1	14.1
Cost Plus Fixed Fee	19.7	24.1	29.9	33.2	34.3	36.8	36.6	32.5	20.7	12.0	9.4
Other Special Contract Types	16.3	18.4	15.8	16.6	14.4	15.0	17.5	13.4	10.3	9.1	2.1

Source: William McCauley, "Defense Procurement and Contracting: An Analysis of Management Changes and Impacts on the Defense Industry," Unpublished Thesis, University of Nebraska, (Lincoln, Nebraska: 1966), p. 51.

TABLE XII

EXPENDITURE FOR RESEARCH AND DEVELOPMENT AND MISSILE HARDWARE BY COST PLUS FIXED FEE CONTRACT DURING PERIOD 1955-1962

Type of Expenditure and Contract Type (Billions of Dollars)	Fiscal Year								
	1955	1956	1957	1958	1959	1960	1961	1962	
Missile Systems	0.6	0.9	1.7	2.2	3.0	3.2	3.4	3.4	1955-1962 Increase 2.8
Research and Development	2.2	2.3	3.2	4.0	5.2	5.5	6.0	6.1	1955-1962 Increase 3.9 Total 6.7
CPFF Contracts	2.6	3.8	5.3	7.3	7.8	7.8	8.3	8.3	1955-1962 Increase 5.7

Source: William McCauley, "Defense Procurement and Contracting: An Analysis of Management Changes and Impacts on the Defense Industry," Unpublished Thesis, University of Nebraska, (Lincoln, Nebraska: 1966), p. 53.

TABLE XIII

FINANCIAL SUMMARY OF SIXTY INCENTIVE AND FORTY-SEVEN COST PLUS FIXED FEE DEFENSE DEPARTMENT CONTRACTS FISCAL YEAR 1962-1963

	INCENTIVE	CPFF
Number of Contracts	60	47
Negotiated Target Costs	$2,049,662	$328,562
Final Cost Allowed	$2,027,660	$334,476
Difference	$ 22,002	$ 5,914
Target Cost Over-run, Per cent		1.8%
Under-run, Per cent	1.08%	
Negotiated Target Profit	$176,248	$19,056
Final Profit at Completion	$171,562	$18,728
Average Negotiated Target Profit	8.1%	5.8%
Average Final Target	8.3%	5.7%
Over-runs		
Number	23	28
Per Cent	38%	60%
Under-runs		
Number	37	19
Per Cent	62%	40%

Source: William McCauley, "Defense Procurement and Contracting: An Analysis of Management Changes and Impacts on the Defense Industry," Unpublished Thesis, University of Nebraska, Lincoln, Nebraska: 1966, p. 70.

TABLE XIV

FINANCIAL SUMMARY OF 139 NAVY FIXED PRICE INCENTIVE CONTRACTS DURING THE PERIOD 1954-1962 (IN THOUSANDS OF DOLLARS)

	1954-1956	1957-1959	1960-1961	1962
Number of Contracts	48	47	24	20
Negotiated Target Cost	$1,501,881	2,534,521	1,431,464	1,103,005
Final Cost Allowed	$1,395,576	2,466,874	1,499,493	1,096,339
	106,305	67,647	68,029	6,666
% Target Cost Over-run (+) or Under-run(-)	7.1%	2.7%	4.75%	0.6%
Negotiated Target Profit	$130,732	222,661	124,390	98,488
Final Profit at Completion	$145,237	241,656	114,505	101,127
Average Negotiated Target Profit	8.7%	8.8%	8.7%	8.9%
Average Final Profit	10.4%	9.8%	7.6%	9.2%
Over-runs Number	6	15	16	8
Per cent	13%	32%	67%	40%
Under-runs Number	42	32	8	12
Per cent	87%	68%	33%	60%

Source: William McCauley: Defense Procurement and Contracting: An Analysis of Management Changes and Impacts the Defense Industry Unpublished Thesis, University of Nebraska, (Lincoln, Nebraska: 1966), p. 72.

TABLE XV

PRINCIPAL SHIPYARDS IN THE UNITED STATES CAPABLE OF CONSTRUCTING LARGE COMMERCIAL AND NAVAL SHIPS

SHIPYARD	COASTAL REGION	EMPLOYMENT LEVEL	MAX SHIP SIZE Length Beam feet
Bath Iron Works Bath, Maine	Northeast	[a]2,800	650 x 80
General Dynamics Corp. Quincy, Mass.	Northeast	[a]8,500	940 x 137
Groton, Conn.	Northeast	[a]12,500	690 x 84
Sun Shipbuilding & Dry Dock Co. Chester, Penna.	Middle Atlantic	[a]4,200	800 x 135
Bethlehem Steel Corp. Sparrows Pt., Md.	Middle Atlantic	[b]16,000	1150 x 190
Maryland Shipbuilding & Dry Dock Co. Baltimore, Md.	Middle Atlantic	[b]12,000	775 x 106
Newport News Shipbldg. & Dry Dock Co. Newport News, Va.	Middle Atlantic	[a]22,000	1100 x 140
Avondale Shipyards Westwego, La.	Gulf	[b]9,000	600 x 90
Alabama Dry Dock & Shipbuilding Co. Mobile, Ala.	Gulf	[b]25,000	750 x 105
Ingalls Nuclear Div. Pascagoula, Miss.	Gulf	[a]5,000	690 x 94
Litton Ship Systems Div. Pascagoula, Miss.	Gulf	[a]11,000	1050 x 175
Bethlehem Steel Corp. Beaumont, Texas	Gulf	[b]4,975	675 x 85

TABLE XV (Cont)

SHIPYARD	COASTAL REGION	EMPLOYMENT LEVEL	MAX SHIP SIZE Length Beam feet
National Steel & Shipbldg. Co. San Diego, Calif.	Southwest	[b]3,398	605 x 105
Todd Shipbldg. Corp. San Pedro, Calif.	Southwest	[b]5,500	665 x 85
Seattle, Wash.	Northwest	[b]5,700	600 x 85
Lockheed Shipbldg. Corp. Seattle, Wash.	Northwest	[b]10,000	700 x 94

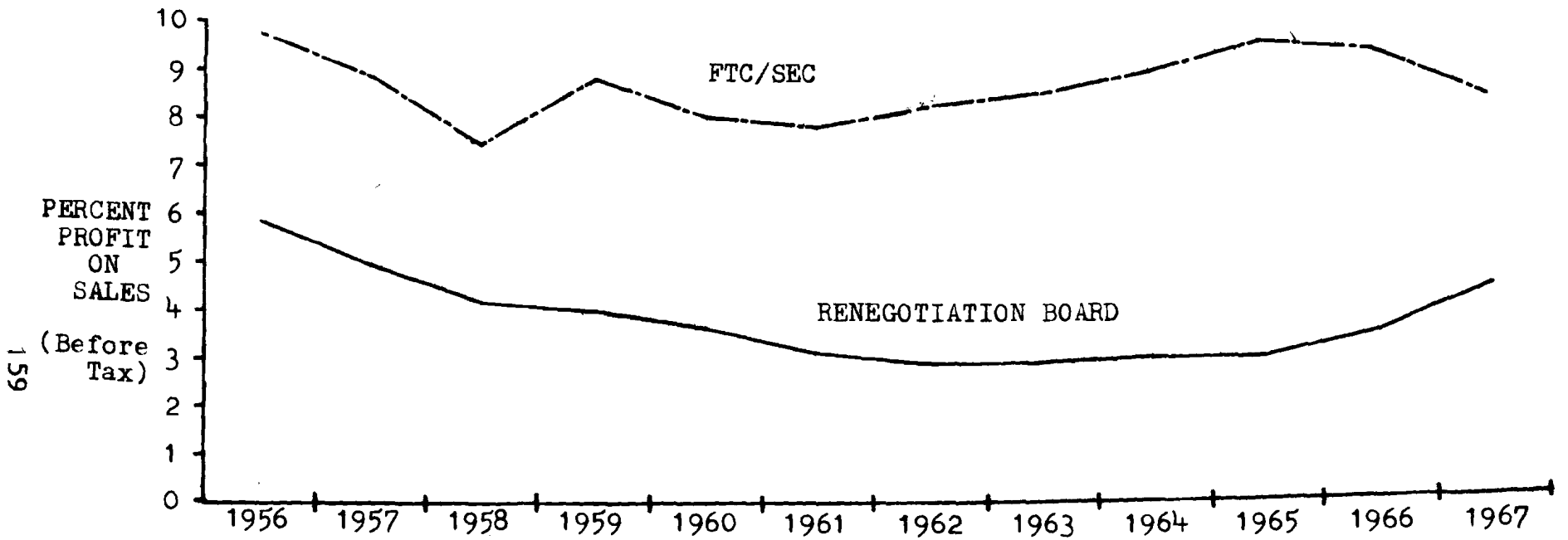
[a]Actual employment as expressed by management during the hearings held by the Seapower Subcommittee in July and August 1970.

[b]Maximum employment of which the shipyard is capable as reported in Principal Shipbuilding and Repair Facilities of the United States, a joint publication by the Department of Defense and the Department of Commerce. Actual employment for these yards may be estimated as approximately 30 to 50% of this figure.

Source: U. S. Congress, House, Committee on Armed Services, Status of Shipyards: Hearings 91st Congress, 2nd sess., 1970; Department of Commerce/Department of Defense, Principal Shipbuilding and Repair Facilities of the United States (Washington: Dept. of the Navy, 1970 February 1970)

FIGURE 1

PROFIT ON SALES; HARD GOODS INDUSTRIES vs GOVERNMENT CONTRACTORS

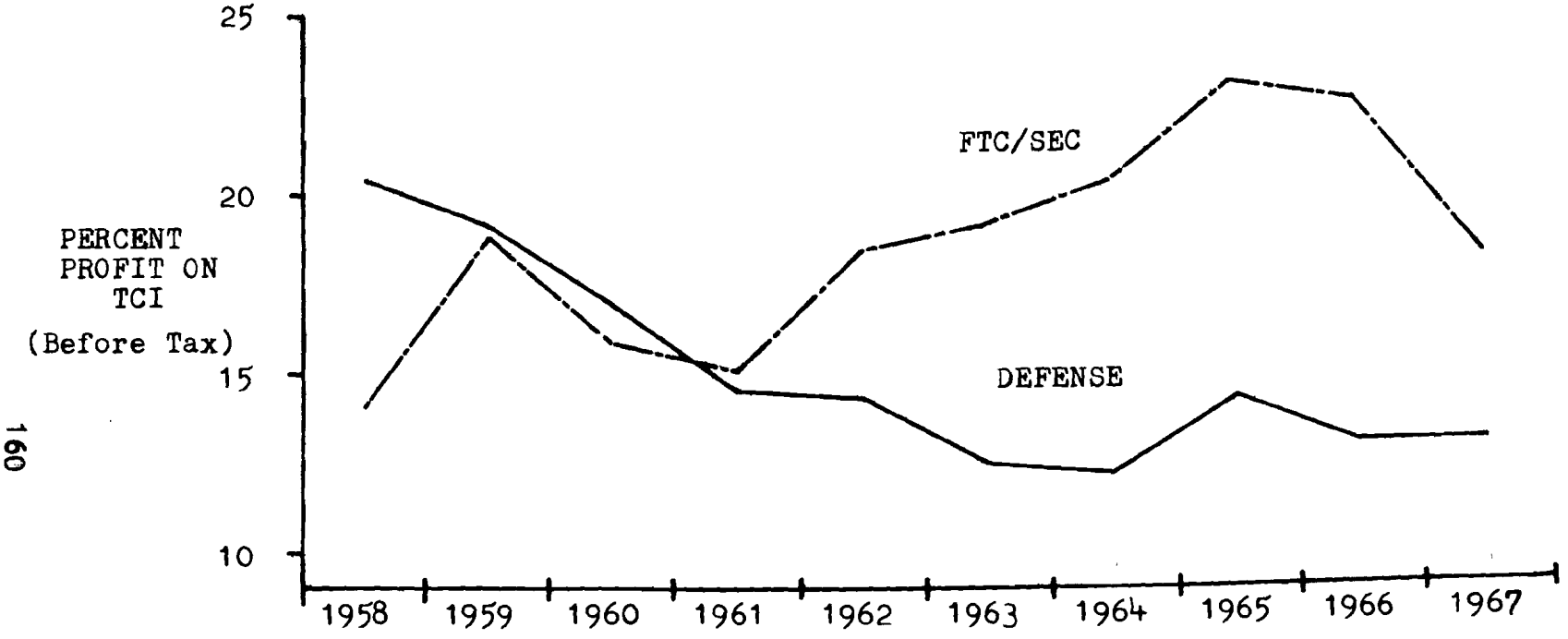


	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967
FTC/SEC $M	307.3	320.0	304.6	337.8	345.7	356.4	389.4	412.7	443.1	492.2	554.2	575.4
% Profit	9.7	8.8	7.4	8.8	8.0	7.8	8.2	8.5	8.9	9.5	9.3	8.3
RENEG BD $M	27.7	26.6	26.3	28.5	25.1	29.3	31.2	39.3	34.8	31.8	33.1	38.8
% Profit	5.8	4.9	4.2	4.0	3.6	3.1	2.9	2.9	3.0	3.0	3.5	4.4

Source: U.S. Congress, Joint Economic Committee, The Military Budget and National Priorities: Hearings 91st Congress, 1st sess., 11 June 1969, p. 530.

FIGURE 2

PROFIT ON TOTAL CAPITAL INVESTMENT, HARD GOODS INDUSTRIES vs GOVERNMENT CONTRACTORS

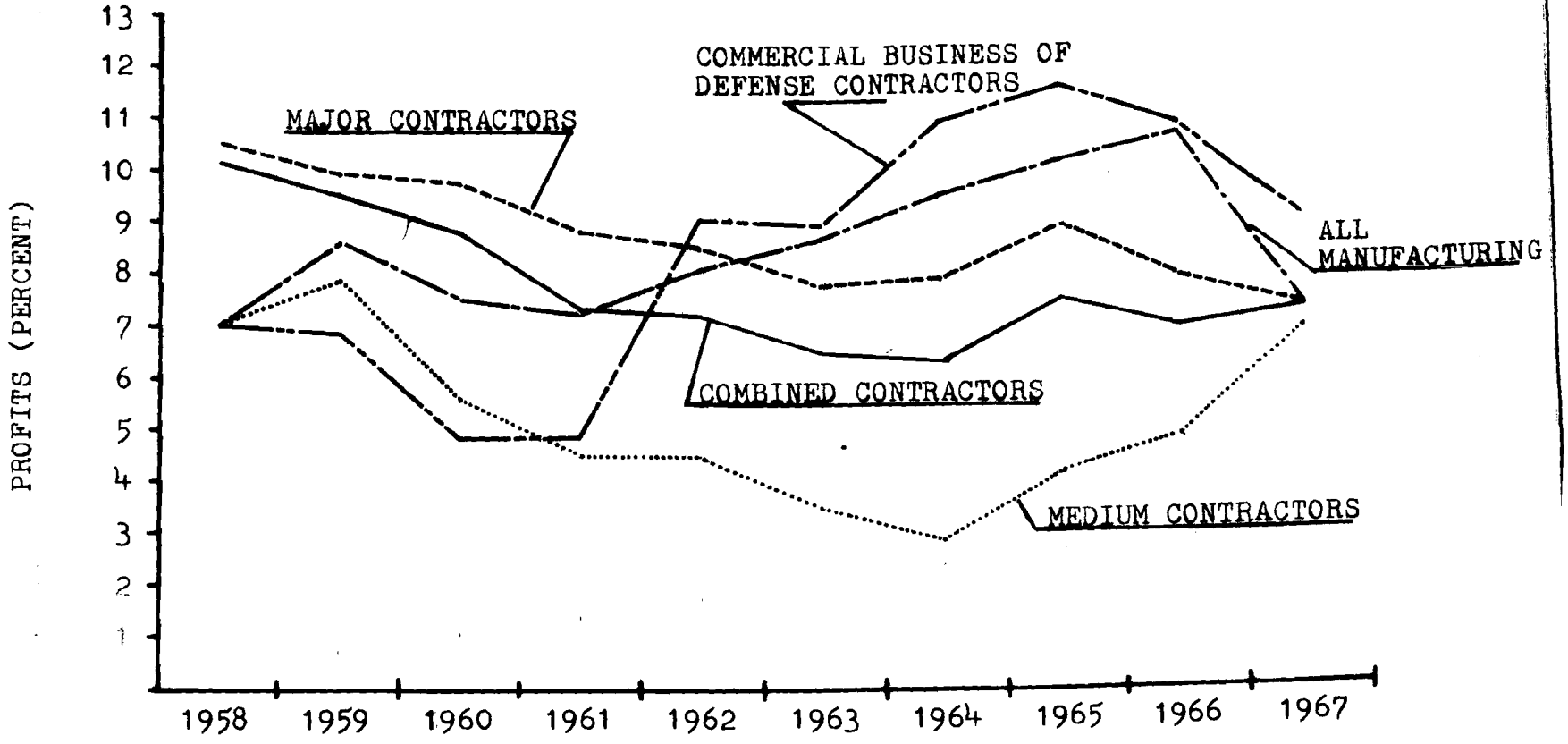


	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967
DEF TCI $M	3267	3486	3416	3942	4316	4425	4184	4123	4911	5556
% Profit/TCI	20.4	19.1	17.0	14.6	14.3	12.5	12.2	14.3	13.0	13.0
FTC/SEC $M	54100	57800	62100	65200	70000	73400	77900	86000	97900	110400
% Profit/TCI	14.1	18.8	15.9	15.1	18.5	19.2	20.4	23.1	22.6	18.2

Source: U.S. Congress, Joint Economic Committee, The Military Budget and National Economic priorities: Hearings 91st Congress, 1st sess., 11 June 1969, p.531.

FIGURE 3

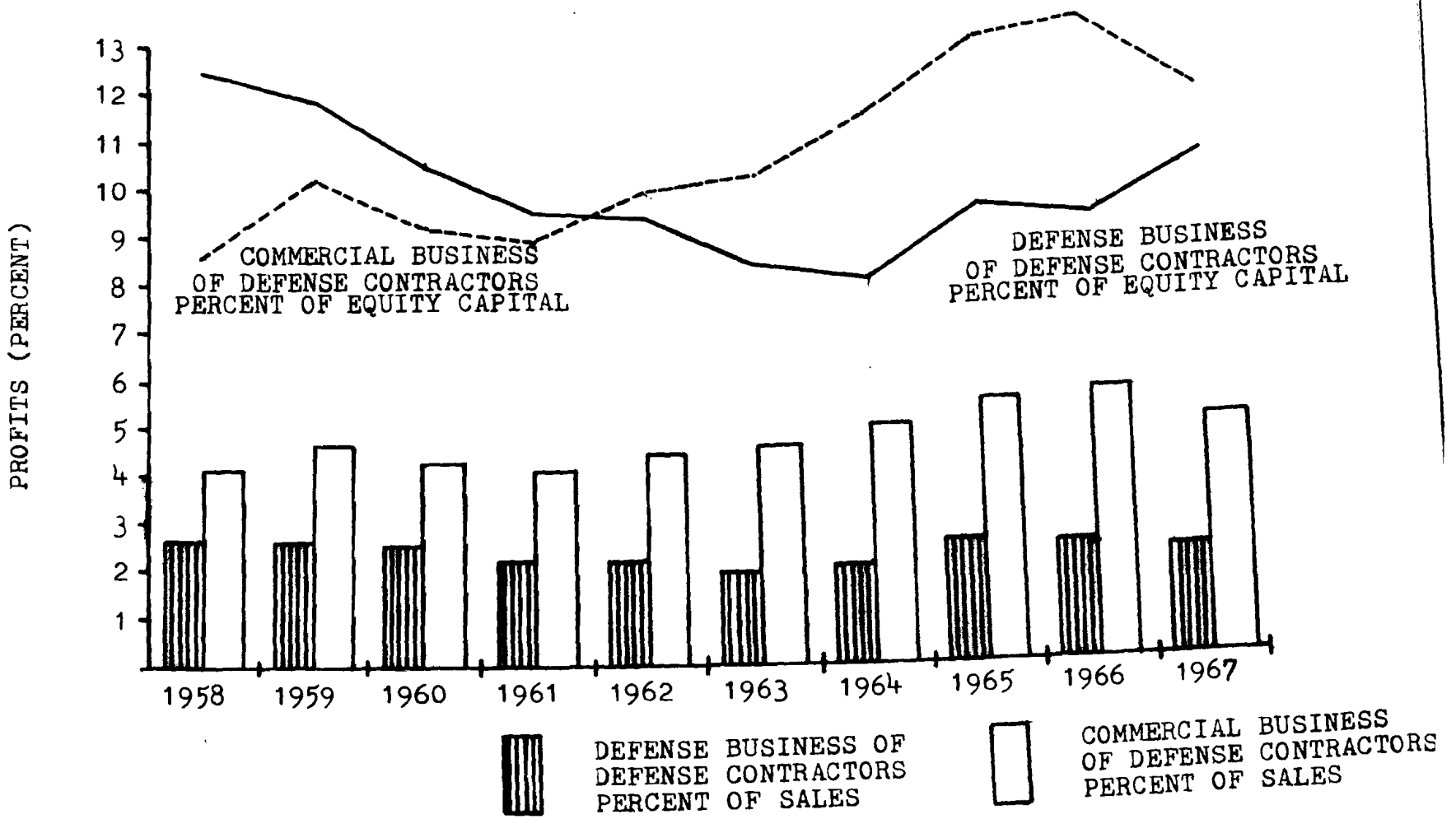
DEFENSE PROFITS-AS A PERCENT OF TOTAL CAPITAL INVESTED



Source: Allan T. Demaree, "Defense Profits: The Hidden Issue," Fortune, 1 August 1969, p. 83.

FIGURE 4

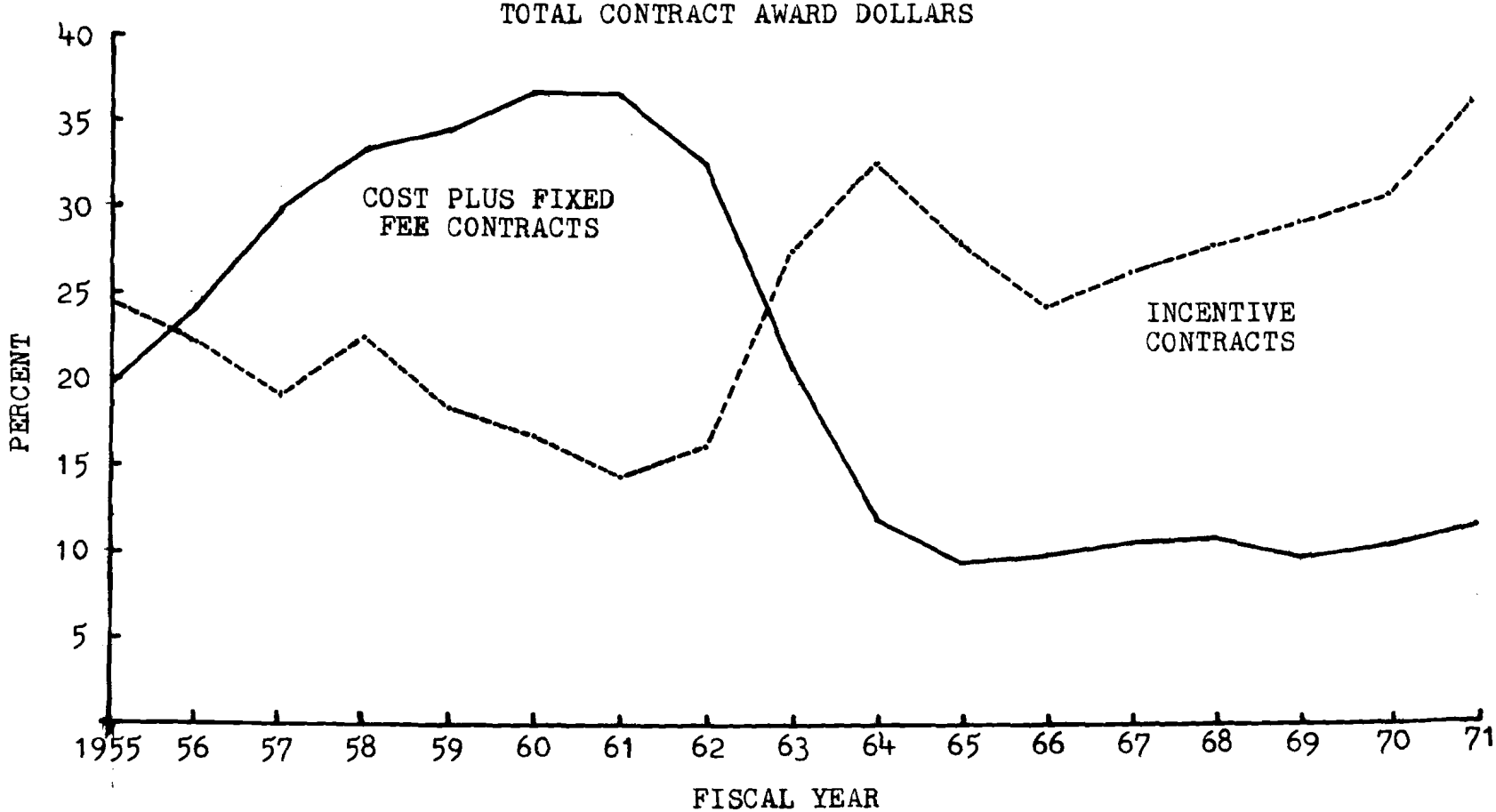
DEFENSE PROFITS AS A PERCENT OF EQUITY CAPITAL AND SALES



Source: Allan T. Demaree, "Defense Profits: The Hidden Issue," Fortune, 1 August 1969, p. 83.

FIGURE 5

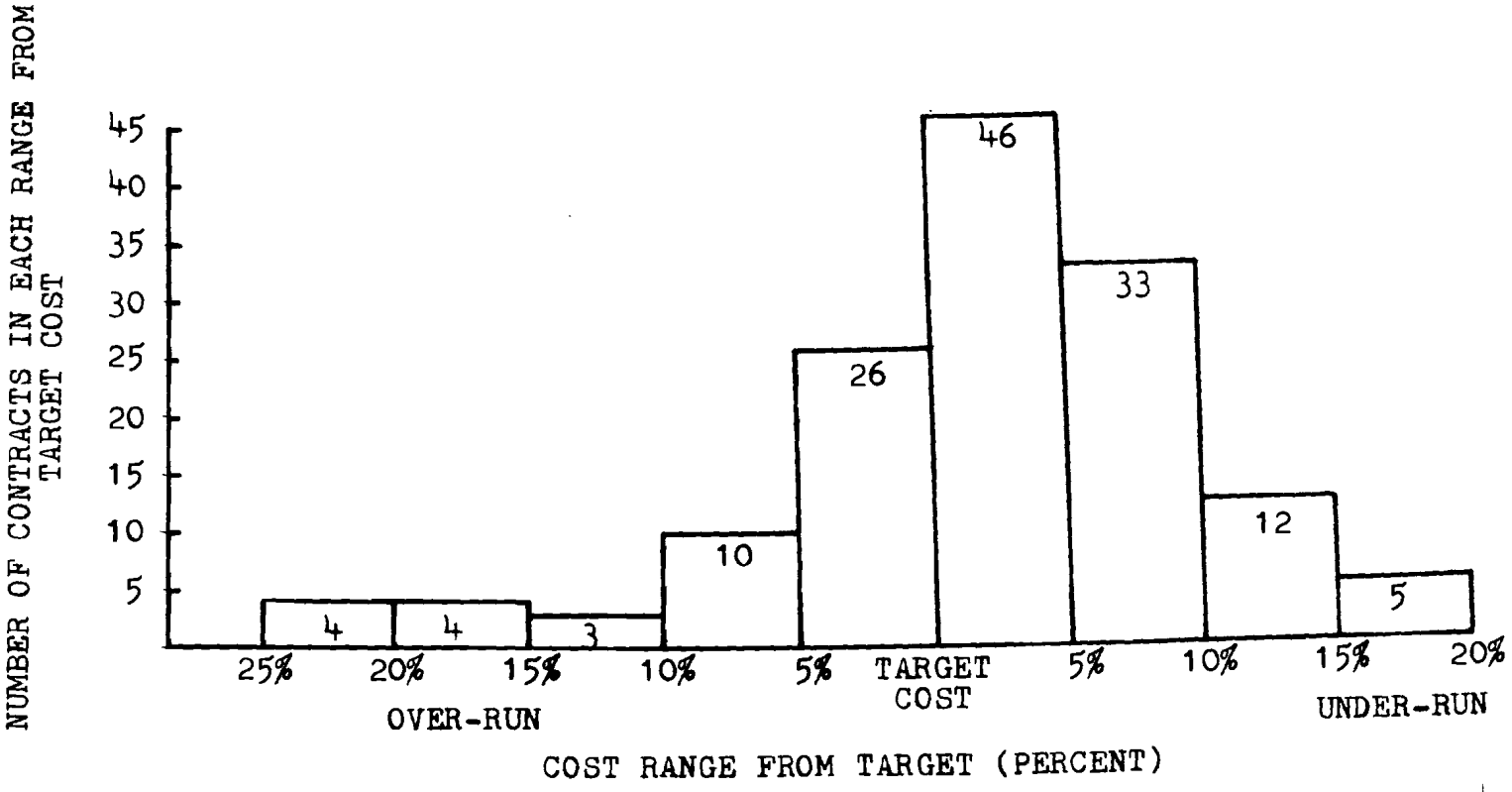
COST PLUS FIXED FEE AND INCENTIVE CONTRACTS AS A PERCENT OF TOTAL CONTRACT AWARD DOLLARS



Source: Office of the Secretary of Defense, Military Prime Contract Awards and Subcontract Payments, (Washington: June 1971), p. 57-58.

FIGURE 6

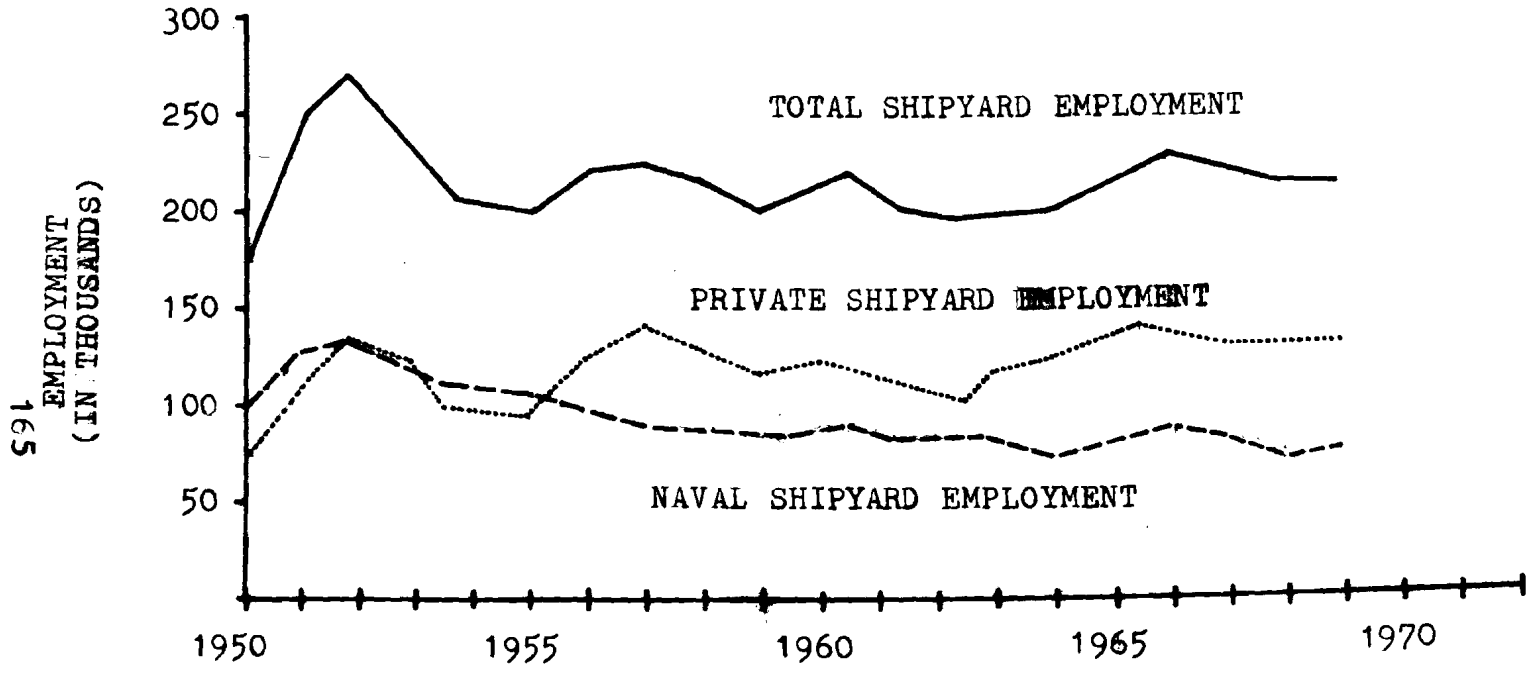
RANGE OF ACTUAL COSTS FROM TARGET COST FOR 139 NAVY INCENTIVE CONTRACTS DURING THE PERIOD 1954-1962



Source: William McCauley, "Defense Procurement and Contracting: An Analysis of Management Changes and Impacts on the Defense Industry," Unpublished Thesis, University of Nebraska, Lincoln, Nebraska: 1966, p. 71.

FIGURE 7

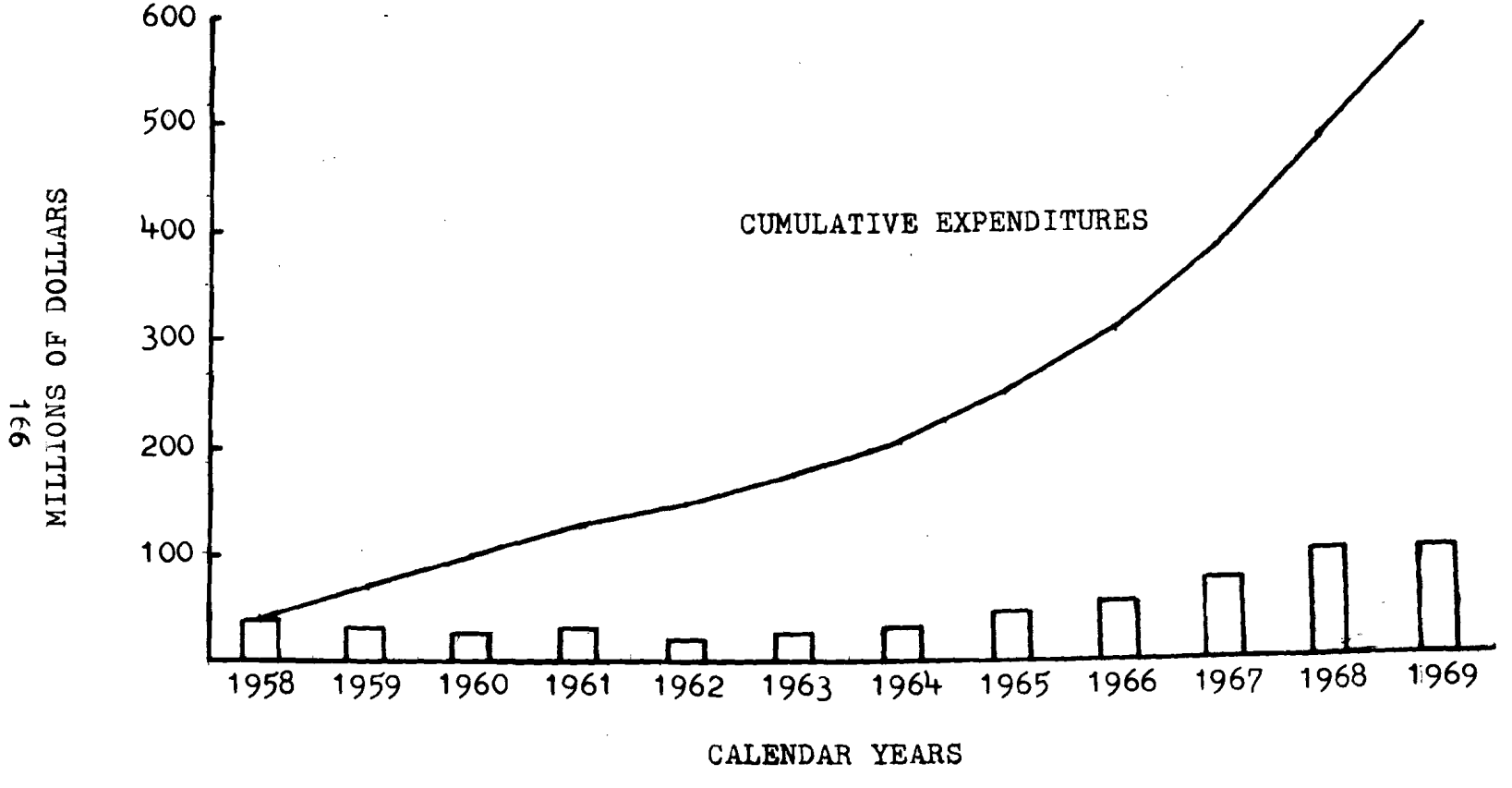
EMPLOYMENT STATISTICS: NAVAL AND PRIVATE SHIPYARDS



Source: U.S. Congress, House, Committee on Armed Services, Status of Shipyards: Hearings, 91st Congress, 2nd sess., 15 June 1970, pt. II, p. 10073.

FIGURE 8

CAPITAL EXPENDITURES IN U.S. SHIPBUILDING INDUSTRY



Source: U.S. Congress, House, Committee on Armed Services, Status of Shipyards: Hearings, 91st Congress, 2nd sess., 15 June 1970, pt. I, p. 10079.