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Study of Aircraft Procurement

Contract Types and Contracting Methods

DEPARTMENT OF THE NAVY

BUREAU OF AERONAUTICS

Washington, D. C.

December 17, 1957

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BOOZ · ALLEN & HAMILTON
Management Consultants

[illegible]

680 MADISON AVENUE
NEW YORK 17
[illegible]

December 17, 1957

Chief, Bureau of Aeronautics
Department of the Navy
Washington 25, D. C.

Dear Sir:

We submit this report in accordance with contract NOas 57-809. It contains the results of our study of contract types and contracting methods in connection with procurement of experimental and production aircraft.

The scope of the study includes the entire life of aircraft programs from the point following contractor selection to the retirement of the last flight unit from fleet service. The process of contractor selection was specifically excluded from this assignment, as were the procurement of aircraft engines and components. One case study was made of a guided missile program. The purpose was to determine whether there was a significant difference between manned aircraft and missile contracting. Although this study provided only a limited look into the missile field, it indicated that aircraft contracting methods are not completely applicable to missiles. Consequently, this report is concerned principally with contracting for manned aircraft.

The framework of the study was provided by present Bureau of Aeronautics procurement policies and instructions. The Armed Services Procurement Regulation was a basic guide as to types of contracts that are authorized or available for aircraft procurement. The Navy's Fleet Introductory Replacement Model (FIRM) plan was also a basic consideration in this study.

A principal objective in this assignment has been to aid in providing a sound foundation for aircraft procurement under present national conditions. The desire has been to search out and recommend specific improvements that will assist in establishing an even more effective contracting function, particularly in view of the increasing importance of the weapon system concept.

It was evident at the outset of this study that neither the contracting function nor the Contracts Division of the Bureau of Aeronautics could be studied validly outside of the total procurement environment. Both the function and the division had to be viewed objectively, and even critically, from the perspective of their positions in relation to the Department of the Navy as a whole, from the standpoint of fundamental BuAer-industry relationships, and in consideration of the inherent nature of aircraft procurement.

To the maximum degree possible this study is based upon both factual evidence and on careful judgment. Obviously, in a subject as

ramified and as broad in scope as aircraft procurement, and one in which intangible factors predominate, it was impossible to obtain factual evidence to support every conclusion. By the same token, it was impracticable to penetrate every area to the degree that would have been necessary to get all details that might apply in every instance. To some extent, therefore, this report reflects opinions, tempered by objective analysis, of Navy and Air Force personnel, of contractors and of other informed persons. This in no way detracts from its validity, inasmuch as the considered opinions of responsible men are in themselves significant and must be considered seriously in working toward problem solutions.

A comprehensive and direct approach was selected for the conduct of this study. The aim was to get quickly to basic and conclusive facts. The intent was to spend a majority of the effort on developing sound solutions, rather than on raking over old problems.

The study approach comprised five steps:

(1) Introduction

Only a very brief period of familiarization was required to put the study team on a working basis. Booz, Allen and Hamilton drew upon its experience in prior assignments for BuAer, for other activities of the Department of the Navy, for the Air Force, and for many companies throughout the aircraft industry in preparation for this assignment.

(2) Initial BuAer-Contractors Study

This phase consisted of series of interviews with all ranks and levels of persons in all divisions of BuAer that were significantly concerned with aircraft procurement. During this period, reports, memoranda, regulations, instructions, contract files and numerous other documents were read, reviewed, studied and discussed. Among the documents studied were records of pertinent Congressional hearings on appropriations, renegotiation and aircraft procurement.

A portion of this period was given to interviews of persons concerned with aircraft procurement in naval activities other than BuAer, at the Assistant Secretary level in both the Navy and the Air Force, and at various levels in Air Force Headquarters, Air Materiel Command and Air Research and Development Command.

This phase included visits to the plants of each of the seven major Navy aircraft contractors. Both top management and working level people were interviewed. Records, schedules, files and correspondence were reviewed in order to observe the operating results of the contracting function from the contractor's vantage point, and also to determine significant problem areas in the procurement field.

Similar interviews and studies were made at seven major Bureau of Aeronautics Representative (BAR) locations. Interviews were held also at each of the three Bureau of Aeronautics General Representative (BAGR) offices.

(3) Study of Air Force Contracting Methods

This phase included an inquiry into Air Force practices in aircraft procurement. The areas of particular interest were: (1) preparations for negotiation, (2) contract negotiation, (3) pricing, (4) use of contract types, (5) contract review procedures, and (6) contract administration. The Air Force concept and application of weapon system procurement and control were also studied.

(4) Case Studies

Four case studies and three phase studies were made in order to pursue in greater depth the problem areas uncovered in the initial BuAer-contractors study. It was felt that a relatively few carefully selected studies would be adequately representative and informative of the total naval aircraft contracting situation. A study in depth covering all BuAer aircraft procurement was, of course, impracticable. Moreover, it was doubtful that the results of such an extensive study would be of any greater practical value to the purposes of this assignment.

The four cases studied in detail and their principal objectives were as follows:

Aircraft	Contractor	Object of Study
P6M (SeaMaster)	The Martin Company	Evaluation of weapon system procurement of an advanced type of jet seaplane
F8U-1, -2 (Crusader)	Chance Vought Aircraft, Inc.	Effect on contracting of the Fleet Introductory Replacement Model (FIRM) plan involving an aircraft that had a relatively short development period
A3D (Skywarrior) A4D (Skyhawk)	Douglas Aircraft Company	Comparison of two concurrent programs in the same contractor plant; one having a slow production build-up and the other a faster build-up
AAM N-6 (Sparrow III)	Raytheon Manufacturing Company	Comparison of contracting for this missile with aircraft contracting

Each of the three phase studies undertaken was limited in scope to a particular point of interest:

Aircraft	Contractor	Object of Study
F9F-8 (Cougar)	Grumman Aircraft Engineering Corporation	Contracting methods applied to aircraft having a long span of production life
WV-2 (Super-Constellation)	Lockheed Aircraft Corporation	Procurement of a commercial type aircraft for military purposes, and contracting methods used for aircraft maintenance
B-58 (Hustler)	Convair-Fort Worth	Air Force example of weapon system management and procurement

The details of these case and phase studies are presented in an appendix volume that is a part of this report.

(5) Development of Conclusions and Recommendations

The results of the total study have been distilled into relatively few major conclusions that touch each principal area that relates to contracting. These conclusions have been refined into a series of recommendations.

The principal conclusions arrived at in this study may be summarized as follows:

(1) In light of the total circumstances that surround the procurement process, the principles by which BuAer conducts its contracting function are fundamentally sound, although some refinements are possible and desirable.

(2) There are, however, opportunities and needs for improving the way BuAer performs its contracting function, particularly its negotiation process.

Recommendations contained in this report are made: (1) to achieve better and more consistent policy guidance throughout the procurement process, (2) to apply more experienced business judgment to contract negotiations, and (3) to develop more effective organization and operating procedures in the contracting function.

(3) The impact of weapon system procurement is not likely to cause a major change in the character of the contracting function. It will, however, require a better job to be done in implementing the present function. Changes in BuAer organization to meet weapon system needs may be necessary.

(4) Much more significantly, the total success of aircraft procurement is limited by factors that go beyond the scope of BuAer's contracting function

The procurement process is one in which the several divisions of the Bureau of Aeronautics, as well as many elements of other government agencies, participate. Operating policies, regulations and safeguards of government, and the body of fundamental laws within which the process of procurement takes place, all bear directly upon the contracting function.

The role of BuAer's Contracts Division is of unquestionable significance. By means of the contractual instrument it issues, it expresses and enforces national policies and laws. It also, in effect, sets in motion the development and production of aircraft required in the national defense.

Nevertheless, it is important to recognize that many, if not indeed most, of the basic problems that exist in the area of aircraft procurement

which are discussed in this report, originate in areas outside the Contracts Division itself. In fact, these problems are part of the environment in which the contracting function is performed.

It is important to recognize, also, that the officers and civil servants whose duty it is to develop, negotiate and administer contracts perform a vital function that requires great skill, patience, loyalty and business acumen. Their sincere efforts merit considerable credit.

Recommendations for corrective action presented in this report are of two levels. The first seeks to get at underlying problems in the contracting function. These recommendations relate to the total procurement process and are far reaching in nature. They may require Department of Defense, executive or legislative action for implementation, and undoubtedly will require considerable time and effort to finalize effective action. In recognition of these facts and also, in view of the current needs, a second level of recommendations proposes those steps for which the Navy now has sufficient implementing authority and which may be effected within a reasonably short time.

The recommendations are highlighted in a separate section at the end of each chapter. They are also grouped into a summary section that precedes Chapter I. The person or agency suggested as the one who should initiate or carry through necessary action for each recommendation is also indicated in the summary.

Six chapters follow the summary section. Chapter I discusses basic considerations that apply to the total function of aircraft procurement. The second chapter analyzes the weapon system concept in relation to aircraft procurement.

Chapter III discusses the details of the aircraft procurement contract. It analyzes the use of specific contract types in specific procurement situations, and recommends appropriate contracting methods. Chapter IV discusses prenegotiation and negotiation practices which are a major part of the total contracting function. Organization and methods for contract administration and control are the subject of Chapter V.

During this assignment it became clear that factors in noncontractual areas outside the scope of this study also bear importantly upon the success of the contracting function. Chapter VI suggests that study into some of these areas might contribute further to the improvement of the procurement process.

A separate appendix volume is a part of this report. It contains the details of each of the four case studies and three phase studies. It also lists the places visited and persons interviewed during this assignment. Finally, it contains a partial bibliography of reports and other documents which were studied in this investigation.

We wish to acknowledge gratefully the contribution that has been made to this study by numerous sincere, conscientious and devoted

persons--military and civilian--in the Department of the Navy, and particularly in the Bureau of Aeronautics. The same grateful acknowledgement is made to the Air Force with respect to the Air Materiel Command and the Air Research and Development Command. Without stint, busy Navy and Air Force people interrupted crowded schedules to assist in making this study a worthwhile effort.

To the same degree, both Navy and Air Force contractors have cooperated in this study. Management and line people have given liberally of their time and freely of company records and information that pertained to this effort.

We are happy to have participated in this assignment which is so close to the national interest and public welfare. As you may deem appropriate, we will be glad to meet with you to discuss the contents of this report further.

Very truly yours,

Booz Allen & Hamilton

SUMMARY

SUMMARY

This summary is a brief of the report on contract types and contracting methods for aircraft procurement by the Bureau of Aeronautics.

The essence of the report is contained in these four over-all conclusions.

(1) In light of the total circumstances that surround the procurement process, the principles by which BuAer conducts its aircraft contracting function are fundamentally sound, although some refinements are possible and desirable.

(2) There are opportunities and needs for improving the way BuAer performs its contracting function, particularly its pre-negotiation and negotiation processes.

(3) The impact of weapon system procurement is not likely to cause a major change in the character of the contracting function. It will, however, require a better job to be done on implementing the present function.

(4) Much more significantly, the total success of aircraft procurement is limited by factors that go beyond the scope of BuAer's contracting function.

In the interest of brevity, this summary highlights the major recommendations contained in the report. These proposals are of two levels: (1) those that are far-reaching in scope, that may require Department of Defense, legislative or executive action to implement, and that are long range in nature, and (2) those for which the Navy has the necessary implementing authority and which can be put into effect in the relatively near term.

These recommendations pertain primarily to manned aircraft procurement. Limited investigation of missile procurement indicated that many of these recommendations may not be completely applicable to missile programs.

Each recommendation indicates the person or office which should be designated as responsible for accomplishing the stated result, or alternately, responsible for initiating the action which will culminate in the desired result.

This summary is organized into six sections under the following headings which conform to the report chapter titles.

1. BASIC CONSIDERATIONS IN AIRCRAFT PROCUREMENT

2. THE WEAPON SYSTEM CONCEPT

3. THE AIRCRAFT CONTRACT

4. THE NEGOTIATION PROCESS

5. CONTRACT ADMINISTRATION AND CONTROL

6. AREAS FOR FURTHER STUDY

* * * *

A sound approach to the study of aircraft contract types and contracting methods requires that the contracting function be placed in proper perspective with the total process of procurement of which it is but one part. For this reason it is pertinent at the outset to consider the basic factors that apply to aircraft procurement.

1. BASIC CONSIDERATIONS IN AIRCRAFT PROCUREMENT

The Navy and the aircraft industry are dependent upon each other for the realization of their own objectives. The Navy needs the contractors' technical and production resources in order to deliver to the fleet the best aircraft, in the time and quantity required, with which to carry out its assigned missions. Aircraft contractors, on the other hand, need the Navy in order to stay in business.

It serves the best interests of both Navy and industry, therefore, for BuAer and its contractors to develop and maintain the most

favorable and effective working relationship possible. The chief prerequisites for this relationship are:

(1) A sound, firm national air defense procurement policy.

(2) A stable, resourceful aircraft industry.

(3) A business-like basis for the conduct of aircraft procurement.

(4) A sincere attitude, shared alike by all levels and ranks of the Navy and industry, of cooperation, respect and mutual trust.

These prerequisites either do not now exist, or they do not exist to the necessary degree. In order to achieve them, the following actions are recommended.

(1) **Press for the Establishment of a Comprehensive National Air Defense Procurement Policy as the Foundation for Effective Industry Relationships and Economic Aircraft Procurement**

This recommendation is a reiteration of recommendations made by a number of investigating groups over the years (e.g., the Brewster Committee and the President's Air Policy Commission). Its implementation is vital to a foundation for a truly effective aircraft procurement process.

Action: Secretaries of Army, Navy and Air Force, through the Secretary of Defense, to secure necessary National Security Council and/or Congressional action

(2) Support Stabilization of the Aircraft Industry to the Degree Necessary To Assure an Adequate Mobilization Base

Total long-term requirements of the three services must be related to industry capacity and capability on a regular and organized basis. Out of this analysis, decisions can be made to equate necessary stabilization of selected aircraft companies with preservation of the desired degree of competition. The purpose is to provide economic aircraft procurement from an industry of sufficient size, capability and resourcefulness to meet both present and emergency Navy requirements.

Action: Secretary of Defense with assistance by appropriate officials of the Departments of the Navy, the Army and the Air Force

(3) Establish a More Effective Partnership with Contractors in Recognition of the Interdependence of Navy and Industry

Working relationships between the Bureau and the aircraft industry should be in the middle ground between the strictly commercial buyer-seller relationship, which is not realistic in military procurement, and complete domination of the industry, which

is not desirable. Steps to place the procurement process on a more business-like basis should include the following:

1. Provide contractors an opportunity to learn more of the Navy's long-range plans and programs.

2. Review and simplify the myriad of regulations, directives and practices that impede rather than encourage constructive working relationships.

3. Instill in all Bureau personnel an attitude toward contractors of respect and confidence rather than suspicion.

Action: To be initiated by the Chief, BuAer

(4) Continue and Expand BuAer's Program To Take Industry Leaders into Greater Confidence Regarding Navy Long-Range Procurement Plans

Meetings between top BuAer and industry officials, such as those recently held to discuss the Navy's long-range requirements, should be continued regularly to promote further the concept of mutual dependency and interest. These and other means should be utilized to provide for exchange of ideas and plans and to permit a two-way discussion of Navy requirements, policies and programs.

Action: The Chief and the Deputy Chief, BuAer

These factors, which are basic to the procurement process, take on even greater significance in view of the heading of the military

services toward weapons of greater complexity and toward the concept of weapon system management and procurement.

2. THE WEAPON SYSTEM CONCEPT

Modern warfare and weapons are causing a reappraisal to be made of the traditional roles in aircraft procurement of BuAer and its contractors. As a matter of practical necessity, the Bureau is having to take a new hard look at the total job that has to be done, and at its own capability to do that job.

The weapon system approach involves, in varying degrees, the delegation to contractors of the responsibility for weapon system management and procurement. This responsibility covers the conceptual design of the total weapon system, specification of all of its parts, the integration of those components into a complete, working system, and demonstration that the total system meets operational requirements. It may involve contractor procurement of some or all of the subsystems formerly provided as government furnished equipment (GFE).

The weapon system approach has been applied in different ways and to a varying extent in recent procurements by both the Navy and the Air Force. No clearly defined pattern has emerged. The heading, however, is toward transfer of greater weapon system management and procurement responsibilities to prime contractors. In this respect

the weapon system concept can assist BuAer to use its own limited resources to best advantage, and still enable it to meet its basic objectives of timely deliveries to the fleet of the most advanced aircraft.

The following recommendations aim at adapting the weapon system approach to Navy aircraft procurement.

(1) Apply the Weapon System Approach Primarily to the Procurement of Experimental Aircraft

The trend in the Navy to give contractors increased participation in procurement programs through use of weapon system procurement should be continued, but should be defined and formalized. The weapon system approach should be used mainly, however, in the research and development phases of an aircraft program, where the needs for design coordination and integration are greatest. The weapon system approach need not be applied as extensively in the production phase. In fact, once the aircraft is placed into production, the needs for standardization and the advantages of large-scale buying may dictate that the Navy supply as GFE, items formerly procured by the prime contractor during the research and development phase.

Action: Approval of concept by the Chief, BuAer

(2) Identify the Specific Responsibilities and Authority of the Weapon System Contractor

In each case of weapon system procurement, the contractor's responsibility and authority for design, development and testing of the total weapon system should be clearly defined and understood. He should also have an explicit understanding of the relative position and authority of the BuAer weapon system manager with respect to the work under contract, and with respect to the handling of major subcontracts. These responsibilities should be spelled out in the contractual document.

Action: Director, Contracts Division, on basis of procurement requests prepared by the cognizant technical division

(3) Expand and Enforce the BuAer Role of Program Monitor and Review Authority

The role that BuAer should exercise under weapon system procurement is that of program monitor and review authority. In this role, BuAer and its field agents (BAR's) should avoid becoming enmeshed in operating details and program routines. Details can be delegated to the weapon system contractor. BuAer's interests should center on assuring the best over-all results of its programs through more selective review of prime contractor operations, and by seeing that he, in turn, is exercising proper control over his subcontractors.

Action: Chief, BuAer by directive

(4) BuAer Should Review and Approve Only Major Subcontracts Generated by Weapon System Contractors

Under weapon system procurement, BuAer's close control of prime contractor detail work is extraneous. The present all-inclusive review of purchase orders by BAR's, for example, should be a contractor responsibility.

BuAer, in its role of monitor, should assure that the contractor's subcontracting procedure is acceptable, and then by spot checks, assure that it is being properly administered. In addition, major subcontracts should be reviewed in terms of the Navy's over-all interests and should be approved by the Bureau, prior to execution by the weapon system contractor.

Action: Chief, BuAer, by directive, with concurrence of ONM

(5) Establish a Proper Fee Structure for Performance by Weapon System Contractors

An equitable fee pattern should be developed to establish a proper recompense for the management contribution and performance of a weapon system contractor. This fee is in addition to and separate from the profit on the portion of the total weapon developed and manufactured by the prime contractor.

Action: Director, Contracts Division with policy guidance from the Chief of Naval Material

The net effect of these recommendations is to place greater responsibility and authority for program details into the hands of aircraft contractors. It is not anticipated that this trend toward the weapon system concept will necessitate or involve any major changes in basic methods of contracting or types of contracts. Nevertheless, the principal means of defining and controlling the role of the weapon system contractor are contained in the contractual document.

3. THE AIRCRAFT CONTRACT

The contracting function is the culmination of many prior decisions, made by many authorities other than BuAer or its Contracts Division, that affect the total procurement process. Except for price, contract type and specific contractual provisions, virtually all other factors relating to the procurement have been settled prior to the formulation of the contract.

The area of operation left to BuAer's Contracts Division is, nevertheless, both considerable in scope and vital in nature. It is the contract document which codifies and establishes all of the bases upon which the Navy will do business with a contractor for procurement of an aircraft. The contract covers not only specification of the item to

be bought and the price, delivery and other conditions under which it will be bought, but also seeks to define, if not enforce, many government policies and regulations.

Nevertheless, the major items of concern to the Contracts Division are contract type, price and the incentive features. These items are interdependent and cannot be considered separately. The recommendations that follow are made with this interrelationship in mind. Concurrence of the Office of Naval Material with these recommendations will be necessary.

(1) Select Contract Type in Consideration of All Elements Present in Each Particular Procurement Situation

In each procurement, the type of contract employed must be the one that best fits the particular circumstances of that procurement. Aircraft buying is a live, dynamic process capable of numerous variations from one situation to the next. No rigid rules can be set and followed in the selection of contract type. Proper selection requires a high degree of sound business judgment and careful analysis of each pertinent factor in a particular procurement situation.

Action: Director, Contracts Division to assure continuance of the policy

(2) In Each Program Phase Use the Contract Type That Provides Maximum Contractor Incentive Consistent with the Degree of Certainty of Specifications and Costs

The Navy's objective should be to provide in each contract the maximum incentive possible under the procurement circumstances. The limiting circumstances are the firmness of the specifications and the availability of cost data upon which to base a price.

In general, cost-reimbursement types of contracts are recommended for research and development and low incentive types for early production. Follow-on production, particularly that which is stable and long run, should permit greater use of high incentive and, in rare instances, firm fixed-price types.

Action: Director, Contracts Division

(3) Recognize the Impracticability of Firm Fixed-Price Contracts under Present Procurement Limitations

Use of firm fixed-price contracts should be confined to long production runs of relatively simple aircraft, such as primary trainers. These instances will be relatively rare. Also, contractors generally will be unwilling to accept this type without provision of extensive contingencies. Thus, in most cases, a lower total price to the Navy can be agreed upon under a fixed-price incentive contract.

Action: Director, Contracts Division

(4) Utilize Fixed-Price Incentive Type Contracts to Maximum Degree

Despite certain recognized limitations in this type, it appears to be the best available compromise answer to the many conflicting factors present in a wide variety of procurement situations. Whenever availability of cost data and firmness of design permit, this type of contract should be considered. Its inherent flexibility permits agreement on price under a variation of circumstances.

Action: Director, Contracts Division

(5) Strive for Earlier Targeting on Fixed-Price Incentive Contracts

In order to make the foregoing recommendation valid, targets for this type of contract must be firmed up considerably earlier than has been the case in the past. The incentive value of a FPI contract depends upon how early in the contract period the target price is established.

Action: Director, Contracts Division

(6) Use CPIF Type Contracts in Aircraft Development Programs To Provide Some Cost Control Incentive

The cost-plus-incentive-fee (CPIF) type contract is a cost-reimbursement contract that provides a sliding scale for determining the contractor's ultimate fee. The greater the cost savings

with respect to the original cost estimate, the greater the contractor's final fee. The opportunity for increased fee through cost savings provides an incentive not found in cost-plus-fixed-fee contracts.

This type of contract can be used in many instances where the CPFF type is now used. Administrative limitations in the maximum fee percentage allowable will have to be raised in order to provide adequate cost reduction incentives to contractors.

Action: Director, Contracts Division for implementation; SecNav for authorization of maximum fee

(7) Negotiate Up-to-Date Basic Agreements with All Aircraft Contractors

Basic agreements should be brought up to date to include all contractual arrangements in effect between BuAer and its contractors. These agreements should be finalized and kept current to permit more rapid negotiation and issuance of contracts, particularly letter contracts.

Action: Director, Contracts Division to initiate through Office of Counsel

(8) Simplify Format of Letter Contracts in the Interests of Speeding up Emergency Procurement

The letter contracts used to initiate long lead time action for emergency procurement should be reduced in content to only those clauses and provisions called for by Armed Services Procurement Regulation. The current trend toward making letter contracts as complete as definitive contracts has defeated the time-saving advantages of this form of contractual go-ahead.

Action: Director, Contracts Division, after approval by the Chief of Naval Material

(9) Provide the Renegotiation Board with More Complete Analyses of Contractor Performance and Maintain Closer Liaison with the Board on Renegotiation Act Matters

More complete and definitive performance criteria should be developed for each factor prescribed in the Renegotiation Act. The Contracts Division should collect from each BuAer division, BAR and other offices concerned, any factual information which may prove to be useful in the objective measurement of contractor performance. These data should be transmitted to the Board for its use in renegotiations.

Also closer liaison between procurement officials and the Renegotiation Board is needed to assure better understanding by

the Board of the objectives of the Navy's procurement and contracting processes.

Action: Chief, BuAer and Chief of Naval Material to initiate

(10) Reiterate BuAer Policy and Strengthen Enforcement of Contract Performance Guarantees in Aircraft Production Contracts

Performance specifications should be considered as goals and should not be enforced rigidly in development contracts. On the other hand, measurable performance standards should be established for production aircraft. Failure to meet these performance guarantees should result in financial penalties to the contractors.

Action: Chief, BuAer to establish policy, Director, Contracts Division to enforce

The foregoing recommendations involve principally refinements and improved implementation of existing contract patterns. Totally new methods do not appear to be needed. The negotiation process, however, because of its impact on the effectiveness of the contracting function requires a more critical review and appraisal.

4. THE NEGOTIATION PROCESS

Negotiation is the process used by BuAer to reach agreement with a contractor regarding quality, quantity, type, delivery, price and other contractual arrangements. Considering the inherent nature of the product, the industry and the other conditions of the procurement environment, negotiation appears to be the only practical method for aircraft buying.

The negotiation of an aircraft contract not only plays a significant role in the formation of Navy-industry relationships, but also individual agreements reached may commit the government to expenditures of hundreds of millions of dollars. The importance of this process, therefore, cannot be overemphasized; yet the present method of conducting a negotiation by BuAer does not befit its importance.

Recommendations for improving the negotiation process are aimed at overcoming the many limitations under which the Navy negotiator works. They emphasize the need for: (1) more comprehensive prenegotiation reviews, (2) more competent personnel to conduct price negotiations and (3) additional staff, training and funds for the negotiating function.

(1) Present Prenegotiation Briefings to Key BuAer and ONM Officials To Establish a Consolidated Procurement Position Which Reflects Top Navy Policy and Management Decisions

More comprehensive prenegotiation reviews should be held by BuAer for all major aircraft procurements. The review should be in two steps. The first step should be a detailed review of the contractor's proposal at the Purchase Branch level, as at present. However, the other BuAer divisions concerned, e.g., Research and Development, Production and Maintenance Divisions, should also participate actively in this review.

As a second step, a presentation should be made to the top management officials of BuAer and ONM for the purpose of reviewing and approving a proposed Navy position and of providing policy guidance to the negotiator. Because of the importance of aircraft procurement to the Navy dollar-wise, attendance at briefings for major procurements by BuAer's Chief or the Deputy Chief, the Assistant Chief for Procurement and ONM's Head of the Contract Clearance Branch should be expected.

Action: Director, Contracts Division with approval and support of the Chief, BuAer and the Chief of Naval Material

(2) Utilize Senior Contracts Division Personnel To Conduct Price Negotiations

It is vital that the best possible skill and judgment be applied to the negotiation and pricing of aircraft contracts. Accordingly, senior personnel, of the competence level of Section or Branch Heads, should be assigned to function as price negotiators. These positions should be constituted and recognized as professional in skill, requirement, aptitude, experience and prestige. They should not be encumbered with excessive administrative duties.

Present negotiators (GS-12) should assist these senior personnel in analyzing proposals and should continue to negotiate the contract terms other than price and contract type.

Action on past due revisions of position descriptions and personnel ceilings for the Contracts Division along realistic lines should also be required to enhance the general competence level of the negotiating group.

Action: Director, Contracts Division to initiate with Director, Personnel Division

(3) Strengthen the Negotiation Function by Providing Additional Staff, Training and Funds

In addition to the foregoing two major recommendations, the following specific steps should be taken to improve the total negotiation process in the Bureau.

1. Provide travel funds to assure participation by appropriate BAR and Navy Audit Office personnel in all major contract negotiations.

2. Conduct more frequent informative staff meetings with all negotiators to review policy and procedural matters and to exchange negotiation experience.

3. Schedule more regular visits by negotiators to contractor plants and BAR offices.

4. Schedule periodic exchange conferences with Air Force negotiators.

5. Develop a comprehensive negotiators' training program and provide competent people from the Contracts Division to present the program on a regular basis.

6. Provide improved physical facilities in which to conduct negotiations.

Action: Director, Contracts Division to initiate or request action, with appropriate approvals from the Assistant Chief for Procurement and Assistant Chief for Administration.

* * * *

This series of recommendations, if promptly and properly implemented, will help to turn the tide of lowered morale and competence

among contract negotiators. It will assist in returning to negotiating personnel some of the job recognition that is due them, and it will place them on more equal footing with their counterparts in industry. In total, it will help negotiators to do a more effective job of pricing aircraft programs.

5. CONTRACT ADMINISTRATION AND CONTROL

The contractual document cannot cover all eventualities in the procurement relationship. Nor does the original contract represent the sum total of the contracting function. Proper administration, interpretation and further handling are of equal importance to the procurement process.

The period of contract administration follows negotiation and issuance of the initial document and may last from two to five or more years. During this time, letter contracts are converted to definitive types, contract amendments and change orders are signed, delivery schedules and quantities may be altered, prices are redetermined and contracts may be terminated. During this period, too, the Navy exercises administrative control to assure contractor compliance with the objectives of the procurement program. This process includes funds control, technical control and manufacturing and inspection control.

Clearly, effective contract administration and control require sound organization and adequate procedures. The recommendations

that follow are designed to call attention to those aspects of contract administration and control that bear most importantly on the Bureau's total procurement effectiveness.

(1) Strengthen Management Control of Aircraft Programs within BuAer by Establishing Centralized Program Management

In consideration of the complexities of the modern weapon system, the need for more prompt and better coordinated decision-making with respect to individual aircraft programs has become more pressing. The Bureau's purely functional organization does not facilitate this end. In recognition of this fundamental need, the Bureau has established the program manager concept.

The ultimate goal should be stronger program management, approaching centralized line authority within individual programs. This goal will take time to achieve on a practical basis, and may involve considerations which are beyond the scope of this survey. Meanwhile, however, some steps can and should be taken to strengthen program management. They include the following:

1. Inform all aircraft contractors of the program manager functions and responsibilities; encourage contractors to deal with program managers on over-all contract administration matters.

2. Make a pilot test on an aircraft program of physical centralization of the program manager and his division assistants in a single office location.

3. Increase the participation of program managers in over-all program direction and control and particularly in funds management.

Action: Systems Director, by direction of the Chief, BuAer

(2) Require IBCC Concurrent Evaluation of Firm Cost Estimates and Technical Feasibility of Engineering Changes as a Prerequisite for Change Approval

The Intra-Bureau Change Committee (IBCC) should make its approval of engineering changes subject to prior examination of ultimate costs, as well as of technical feasibility. The following steps should be taken to implement this recommendation:

1. Except in real emergencies, require all aircraft contractors to submit firm cost estimates with all change proposals. Cost estimates should be at least as firm and definitive as the technical proposal.

2. Determine the feasibility of the proposed engineering change and its point of installation on the basis of the technical advantage to be gained in relation to the cost of the change. The technical and cost decisions should be made concurrently and with equal weight by the IBCC.

3. The present block system for incorporating engineering changes in production aircraft should be observed and enforced.

Action: IBCC, Research and Development Divisions and Contracts Division, by direction from the Chief, BuAer

(3) Revise Procedures and Staffing Requirements in BAR Offices To Provide Surveillance of Contractor Policies and Procedures, Rather Than Detailed Verification of Routine Documents

In line with the role of BuAer as monitor and program review authority, BAR personnel should be relieved of responsibility for detailed reviews that can and should be accomplished by the contractor. Two specific changes along these lines are warranted.

1. BAR engineering divisions should concentrate their efforts on surveillance of engineering, with occasional spot checks, in lieu of detailed verification of all engineering drawings.

2. More selective review of procurement documents, with greater attention to the large dollar purchases and the over-all subcontracting program, should be substituted for across-the-board review of each purchase order.

Action: by directive from the Chief, BuAer

(4) Assign to BAR Contracting Officers Authority To Finalize Their Negotiations

BAR contracting should be authorized to finalize, in prescribed contractual form, all negotiations which they have authority to conduct. This arrangement will expedite procurement action appreciably without any significant loss of over-all fund control by the Bureau.

Action: Director, Contracts Division, with approval by Chief, BuAer

(5) Expand Career Development and Training Programs for Contracting Personnel in BuAer and BAR Offices

The procurement function within BuAer is of sufficient importance to warrant "career status" for both naval officers and civil servants. A comprehensive development and training program should be developed including:

1. Longer duty tenure and planned rotation between the Bureau and BAR offices for key officer personnel.

2. More extensive development and on-the-job training of civilian personnel to increase competence and minimize turnover.

Action: Office of the Chief, BuAer to develop the overall program. Approval by BuPers and EXOS may be required

(6) Maintain Closer Control and Follow-Up of Procurement Document Processing

Present efforts to minimize delays in processing contract documents and changes should be expanded to include:

1. More selective routing of procurement documents on the basis of content and need.

2. Central control and follow-up of engineering change proposals and change notices.

3. Submission of reports on total procurement document flow to a central, authoritative control office in BuAer for review and initiation of corrective action.

Action: Office Services Division to develop procedures for approval and attention of the Chief and the Assistant Chiefs, BuAer

(7) Periodically Review Contract Cost Reports To Assure Highlighting of Potential Cost Overruns and Integration with Total BuAer Reporting Requirements

Recently established reports requested of contractors by the Production Division and the Systems Director should assist materially in identification of potential overruns before they become too large. These reports should be reviewed periodically to assure that they provide adequate cost projections at major check points in the program and are fully integrated with total Bureau reporting requirements placed on aircraft manufacturers. In addition, Bureau requests for program projections should be integrated with reporting requirements of the Air Force and the Army where applicable in the case of certain contractors.

Action: Systems Director and Production Division to spearhead this cost control effort in cooperation with program managers concerned

Many of the foregoing contract administration control recommendations extend considerably beyond the contracting function per se. In several instances further investigation, beyond the scope of this study, is needed to develop the necessary implementation plans from

a balanced, Bureau-wide point of view. These and other areas for further study are presented in the next section.

6. AREAS FOR FURTHER STUDY

As this study of contract types and contracting methods progressed, it became evident that other factors in noncontractual areas also had a direct bearing on the success of aircraft procurement. For example, instability of the industrial activity level can lead to high cost, low quality production aircraft. The effects of such other factors could have a much more profound and far-reaching effect on the procurement process than can the type of contract used in a particular purchase.

It is appropriate, therefore, to consider these other areas as subjects for future profitable study. There are described in the following paragraphs:

(1) Review the Total BuAer Organization from the Standpoint of the Balance that Exists, and that Which Should Exist between its Technical and Procurement Functions

The Chief, BuAer should consider the full adequacy of the present organization of the Bureau in light of its function as a materiel bureau, the relative importance of the procurement process, and the organizational impact of complex weapons and weapon system management and procurement.

(2) Continue the Investigation Started by BuAer's Aircraft Division To Establish Controls over Engineering Changes

Because of the impact of engineering changes upon the cost and complexity of aircraft programs, the Chief, BuAer should direct a comprehensive and far-reaching investigation into the causes and control of changes. The object of this study should be to reduce both the number and scope of design changes.

(3) Study Procurement of Guided Missiles To Develop Specifically Suitable Contract Types and Contracting Methods

The inherent differences in aircraft and guided missiles procurement should be recognized. The increasing role of the missile in modern warfare warrants a separate study into the particular contracting needs of guided missiles.

(4) Study Design Competition and Contractor Selection To Develop the Means To Assure the Best End-Product at the Most Reasonable Cost

Source selection, long a difficult problem, should continue to receive serious attention. The needs to obtain the best, most advanced aircraft is frequently in conflict with the pressure from some sources to maintain a guise of industrial competition or with needs for greater industry stabilization. Also, the present Navy practice of securing competitive design proposals from a

large number of contractors may no longer be justified economically. These and other factors in the contractor selection process should be reappraised in the light of present conditions.

(5) Establish Criteria by Which To Measure Total Contractor Performance

A study should be instituted that will result in the establishment of valid, consistent and generally accepted criteria by which contractor performance can be assessed. Such criteria would be a major contribution to putting the procurement process upon a factual and systematic basis, and would aid in future contractor selection.

This list, by no means, exhausts the additional areas in which the contracting function and the procurement process can be studied profitably. Aircraft procurement is a dynamic process. Continual study and alertness to the need for change and improvement should be the rule for those engaged in the process of aircraft procurement.

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I. BASIC CONSIDERATIONS IN AIRCRAFT PROCUREMENT

I. BASIC CONSIDERATIONS IN AIRCRAFT PROCUREMENT

Aircraft procurement is one of the Navy's biggest businesses. In recent years, naval aircraft obligations have equalled or surpassed those for ships. The almost three billion dollars programed each year for the past three years for aircraft and for aviation materials, supplies, operations, facilities and for research and development amount to about one third of the total annual Navy budget.

The change of complexion of BuAer since World War II reflects the importance of procurement. Prior to that time the Bureau was essentially technically oriented. Research, development and specification of the ultimate aircraft design were its major interests along with the technical aspects of supply and maintenance.

Elements of the procurement function have since been added to BuAer's responsibilities. In effect, it has become a materiel bureau. Within requirements established by the Chief of Naval Operations, BuAer now specifies the aircraft that are to be bought, and it also buys them. In a major sense, BuAer has major responsibility for supplying the naval air arm. In addition, it is the Navy's principal point of contact with a large segment of the nation's industry.

It is in the Bureau's Contracts Division and in the contracts that are formulated there that the desires, needs, conflicts, strengths and weaknesses of government and of aircraft contractors meet and come to focus. It is there that, to a large degree, government-industry relations are formed.

Nevertheless, it is essential to recognize that the contracting function is but one element in the total process of procurement. Completely successful aircraft procurement depends upon a totally effective process.

It is also necessary to recognize that typically in government a wide gulf separates the immediate working level from the final decision authority level. To this is added the complication of participation by many lateral organizational elements in an ultimate decision. The route to decision in industry is usually shorter and less complicated. This does not in itself guarantee better decisions. It frequently provides decisions more quickly.

A more fundamental contrast between Navy and industry is provided by the motivations and needs of each. The Navy's central theme is to supply the best aircraft that will satisfy defense objectives at the least ultimate cost. Industry is, of course, profit oriented and has a basic need to stay in business. These goals are not inherently antagonistic. The contracting function should be able to achieve a satisfactory

adjustment of the interests of both parties. To the degree it does, effective aircraft procurement is more likely to be assured.

The balance of this chapter is given to an objective analysis of these considerations that are basic to aircraft procurement. The purpose is to place the contracting function into proper perspective so that valid conclusions can be drawn and constructive recommendations made.

The sections that follow discuss the status and function of contracting, the nature of aircraft procurement, motivations and needs of both BuAer and contractors with respect to aircraft procurement, and the basic responsibilities of contractors. Major conclusions are presented and discussed under each section heading. Prerequisites for effective BuAer-industry procurement relationships are stated in the form of recommendations at the end of the chapter.

1. STATUS AND FUNCTION OF CONTRACTING FOR NAVAL AIRCRAFT

A sound approach to this study of aircraft contract types and methods requires understanding of the relative position of the contracting function within the total procurement process. In its broadest sense, procurement covers a wide series of related activities, from determination of a need for a particular type of airplane to the support of the aircraft in fleet service. The contracting function covers only

parts of this scope. Basically, it establishes the specific conditions under which the government, in relation with a supplier, will acquire a specified product or service.

The paragraphs that follow describe further and amplify this relationship between the contracting function and the entire procurement process.

(1) The Contracting Function Is One Element in the Total Procurement Process

The millions of dollars that flow annually from the Department of the Navy to the aircraft industry funnel through the Bureau of Aeronautics' Contracts Division. In this Division are documented the legislation, policies, regulations, directives, plans, programs, specifications and schedules that apply to aircraft procurement in general, and to the buying of specific aircraft in particular. This division codifies and embodies into a contractual document the relationship established or desired between government and contractor for the supply of flight articles for fleet service.

However, contracting is only one element, albeit a vital one, in the entire process of procurement. The total process includes: (1) broad policy determination and guidance, (2) definition of requirements for the aircraft, (3) budgeting of funds,

(4) allocation of funds to programs, (5) specification of the end-item desired and its components, (6) provision, as necessary, of production equipment and facilities, (7) scheduling of unit quantities and delivery dates, (8) provision of spare parts, modernization, overhaul and repair, (9) product testing, inspection and acceptance, (10) contracting and (11) contract review and approval.

The process is a continuing and dynamic one. Depending upon specific situations, it involves changes, amendments, aircraft modifications and other action that may require a retracing of some or all of the elements.

In only a few of these procurement elements does BuAer have the authority of final decision. In most cases, as shown in Exhibit I, which follows this page, many agencies outside the Bureau play a much more decisive role in procurement.

(2) <u>BuAer Shares Responsibility for, and Has Limited Authority over, the Contracting Function</u>

Neither BuAer nor the Contracts Division exercises centralized control over the contracting function. This reflects an organizational situation inherent in the Department of the Navy.

EXHIBIT I

Bureau of Aeronautics
Department of the Navy

ELEMENTS OF THE PROCUREMENT PROCESS

Element	Authority of Decision
Procurement policy and guidance.	Congress, Secretary of Defense, Secretary of the Navy, Chief of Naval Material.
Operational requirements, aircraft mission and military characteristics.	Chief of Naval Operations.
Aircraft procurement funding--appropriation, apportionment, allocation, and program obligation.	Congress, Bureau of the Budget, Assistant Secretary of Defense (Comptroller), Assistant Secretary of the Navy (Financial Management), Navy Comptroller, BuAer Comptroller, BuAer Production Division.
Aircraft fleet delivery schedule.	Deputy Chief of Naval Operations (Air).
Approval to initiate aircraft design competition.	Chief, Bureau of Aeronautics.
Design award and contractor selection.	Chief, BuAer; BuAer Evaluation, Production, Maintenance, Aircraft and other divisions; also, Deputy Chief of Naval Operations (Air), Assistant Secretary of the Navy (Air) and Secretary of Defense, as necessary.
Establishment of design and performance specifications.	BuAer divisions under Assistant Chief for Research and Development, also Production and Maintenance Divisions.
Issuance of Procurement Request to BuAer Contracts Division to initiate contractual action.	BuAer Production Division, Maintenance Division or other originating division.
Allocation of facilities (production, equipment, etc.)	BuAer Industrial Planning Division, Chief of Naval Material, Assistant Secretary of the Navy (Material), Office of Defense Mobilization, Department of Defense.
Inspection and acceptance--design test through to production acceptance.	BuAer Quality Control Division, Naval Air Test Center, Fleet Commanders.
Contracting documentation and negotiation changes and amendments.	BuAer Contracts Division.
Contract review.	Office of Naval Material.

Several Navy bureaus have procurement responsibility. BuShips, BuOrd and others, as well as BuAer, buy the items for which they have specialized cognizance and technical competence.

To the degree that centralized procurement control is provided by the Navy, it is exercised by the Office of Naval Material. This office is responsible to the Secretary of the Navy for providing procurement policy guidance and supervision to each of the bureaus.

ONM, through the Navy Procurement Directives it issues, seeks to achieve standardization and uniformity in the contracting function as it is practiced throughout the Navy. In working toward this end, however, it has been necessary to reach for practical compromises in view of the technical procurement problems associated with the diversity of products the Navy buys. Although broadly satisfactory in the main, these compromises that are reflected in ONM approved contracting procedures are not necessarily oriented to the specific problems of aircraft procurement. To this extent, the BuAer contracting function is limited in scope and in flexibility of action.

This relationship of BuAer to the total aspect of Navy procurement must be given proper weight in any comparison of the

Bureau with the Air Force. It is apparent that, in aircraft procurement, the BuAer and Air Force situations are somewhat similar. They are not analogous. These similarities and differences are reviewed in subsequent sections of this report.

(3) The Contracting Function Is Subject to and Influenced by Reviews of Several Governmental Levels

In addition to contract reviews within the Contracts Division of BuAer, aircraft contracts are or may be reviewed by ONM, Renegotiation Board, General Accounting Office and Congressional committees.

The Office of Naval Material reviews all letter contracts and all other negotiated contracts in excess of $300,000. It appraises the total contracting transaction against policy and practice, and may approve, reject or recommend modification of the contractual document.

The Renegotiation Board may review cost and performance of all major aircraft contractors to determine whether their total business volume in a given year resulted in excess profits.

The General Accounting Office and Congressional committees have been interested in investigating the total function of contracting and in reviewing the results of negotiations.

Among the committees of the Congress which have exhibited particular interest in aircraft procurement are the Committee On Appropriations of the House of Representatives and the Subcommittee of the Select Committee On Small Business of the Senate. The Subcommittee For Special Investigations of the House Armed Services Committee has been particularly active recently in its full-scale review of the conduct of the procurement process.

The net effect of these reviews is to establish an environment for the contracting function in which apprehension of unfair or unreasonable criticism affects naval officers and civil servants alike. Generally, these reviews are made long after the fact, when the people originally involved may no longer be present or may no longer have current information on the subject.

On the other hand, both contract negotiators and contractors have been made forceably aware, through these reviews, that caution and conservatism are appropriate and necessary in procurement. To some extent, therefore, they serve as a desirable check on possible abuse of the process.

The aircraft contracting function clearly is a vital part of the procurement process. In its position at the focus of Navy and contractor production interest it is subject to many immediate influences. Among

these are the pressures which stem from the very nature of aircraft procurement. The impact of these pressures is discussed in the next section.

2. THE NATURE OF AIRCRAFT PROCUREMENT

The contracting function is surrounded by a variety of conditions and influences that are inherent in the nature of aircraft procurement. Most important among these are the characteristics of the aircraft industry, the aircraft itself and the impact of the aircraft industry upon the national economy.

The Navy, along with the Air Force, constitute approximately 90% of the market for aircraft manufacturers. In those cases where a contractor has specialized in a type of aircraft (such as Chance Vought) the Navy may represent, effectively, the company's only customer. In this case, the continuity of the company, and its employees and technical skills, depends upon the business its customer can give it.

The Navy may be equally dependent upon the individual or specialized contractor. Since there are, and can be, so few aircraft contractors that make up the industry, the opportunity for the Navy to "shop around" for its needs are limited.

The aircraft itself contributes in major part to the nature of procurement. "If it flys, it's obsolete" is a somewhat exaggerated indication of the pace of technological progress. It is important, nevertheless, to note that a major share of procurement activity is currently centered on aircraft development programs as contrasted with production of standard inventory aircraft.

According to past experience important aircraft developments occur primarily in peace time. It may be expected, therefore, that for the present, aircraft procurement may continue to be influenced by the need to buy fairly small quantities of a fairly wide variety of types and models.

Of major significance in determining the nature of aircraft procurement is its impact upon the national economy and welfare. As an industry, it is the country's largest single employer. In certain sections of the country, its members may provide the only significant employment opportunities for large masses of population.

The combination of all of these factors tends to make the contracting function a highly specialized effort. The effect of these and related factors are discussed further in the following paragraphs to provide a better understanding of the total contracting environment.

(1) The Aircraft Industry Cannot Realistically Operate on a Freely Competitive, Private Enterprise Basis

Aircraft company managers have a natural desire to operate their businesses with the degree of freedom and self-determinism that is implicit in the American free enterprise system. They tend to resent government controls and reports, and they feel too closely supervised. They object to government "interference" in their accounting practices, inventory control procedures and in their way of doing business. As pointed out in the Hoover Commission report under the topic: "Basic Philosophy In The Employment of Contractors," they prefer and hope to achieve more of a commercial type of relationship with government.

On the other hand, these managers appreciate the rules, pressures and difficulties under which the government must operate. They are aware that their customer, ultimately, is the only one who can determine the acceptability of their product. They are realistic enough to accept the fact that, since BuAer contributes to the end-product so greatly with funds, facilities and effort, it is appropriate and even necessary for BuAer to have a voice in the process leading up to the end-product. Also, to the degree the government shares the risk of the business with the contractor, it is appropriate for the government to make sure that risk is kept under proper control.

It is, thus, an inevitable characteristic of the aircraft industry that it will continue to be dominated by the Navy, and by its other major customer, the Air Force. Contractors, therefore, must achieve a practical adjustment of the inherent conflict between their desire for independent operation and the need for the military to exercise its fundamental responsibility for the nation's defense.

(2) Industry's Relationship with Its Aircraft Customer Is Made Up of a Combination of Dependence and Uncertainties

The buyer-seller relationship that generally exists between two parties to a commercial contract does not apply to the same degree between government and aircraft contractor. Even in comparison with other government contracting, the aircraft industry has a unique relationship.

Roughly, nine tenths of the industry's total output is obligated to the government. Few companies have the financial resources, the technical skills and the production facilities to be a prime contractor for both the Air Force and the Navy. Even fewer aircraft companies have any sales opportunities beyond the Air Force and the Navy.

No company has the capability to finance the development, production and plant requirements of an entire aircraft program

on its own, or to risk the accidental loss of its product. To a very major degree, therefore, aircraft contractors are dependent for their business existence upon the plans and budgets of the Military Establishment.

On the other hand, a great part of the contractor's relationship with BuAer is tied to an uncertain knowledge that proposed aircraft procurement plans will be approved, that funds will be made available, or that funds presently available will remain earmarked and sufficient for a particular aircraft program.

This uncertainty tends to prevent contractors from firming up business plans until a contractual document is signed.

(3) Long Time Cycles Are Characteristic of the Aircraft Procurement Process

New aircraft procurement generally originates as an operational requirement transmitted by the Chief of Naval Operations to the Chief, Bureau of Aeronautics. If the requirement cannot be satisfied by an existing aircraft model, a design competition for a new model is held among interested companies in the aircraft industry. Design proposals are evaluated and a winner is selected based largely on the potential of the design to satisfy, not only the initial, but also the ultimate operating requirements.

Design specifications are firmed up and a contract written to cover, usually, two experimental aircraft plus a partial unit which is intended only for extensive structural and laboratory tests.

On the basis of test results, fleet needs, production planning and availability of funds and with proper authorization, BuAer's Production Division may issue a procurement request for pre-production or production quantities of the aircraft. This request is the Contracts Division's authorization to initiate procurement action.

In the case where a new operational requirement can be handled adequately by a variation of an existing aircraft model, essentially the same procedure is followed. The design competition stage is eliminated since it would generally be uneconomical to start another company into production where one was already established.

As much as five years or even more may be involved in research and planning prior to the issuance of a formal operational requirement. From the issuance of the requirement until production of the experimental aircraft is begun, a year and one half to two years may pass. On the average, regular production is begun three or three and one half years after that. Initial

deliveries of production aircraft to the fleet may be started six or seven years after the operational requirement was first issued. The contracting cycle may go on for another two or more years before all documents and related matters are settled and contract files are closed on a procurement. Such closing is likely to be temporary, however, since as long as an aircraft is in fleet service it is bound to be reordered, require service or need other attention that inevitably calls for contractual action.

Exhibit II, which follows this page, is based on a chart originated by BuAer to show the time cycle of the contracting function. The times and events depicted in the exhibit are approximate. Actual values depend upon specific aircraft types and models and on specific contractor situations.

(4) A Basic Navy Procurement Conflict Is the Desire To Obtain the Latest and Best Aircraft Development, and the Need for Rapid Production Deliveries to the Fleet

A basic objective of the Navy is to supply the fleet with the best aircraft that reflects the latest and most advanced technical qualities. At the same time, it is incumbent upon BuAer to assure timely fleet delivery of aircraft. These two needs tend to pull in opposite directions.

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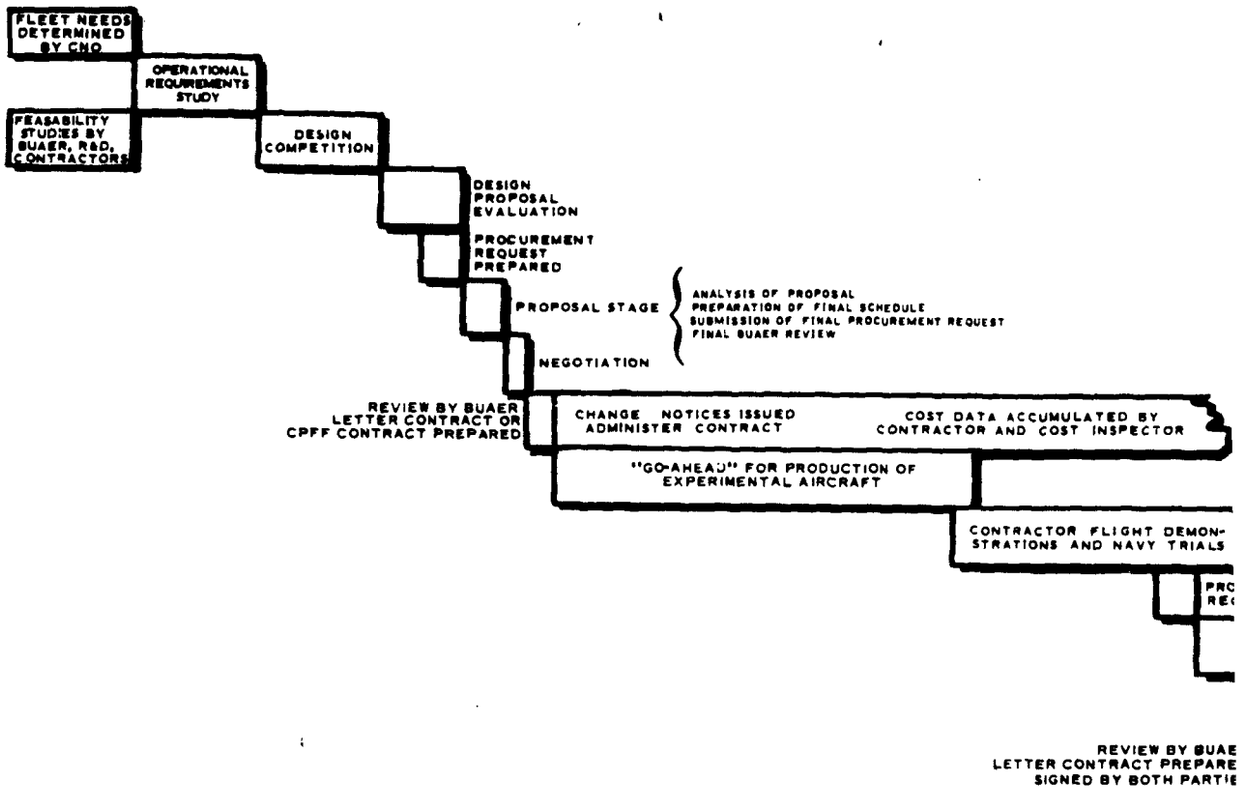


TIMES SOURCES

(1) FIRM Plan

(2) Actual times for conversion of letter contracts for 1954 and 1955

(3) Actual times for redetermination of incentive type contracts completed in 1955

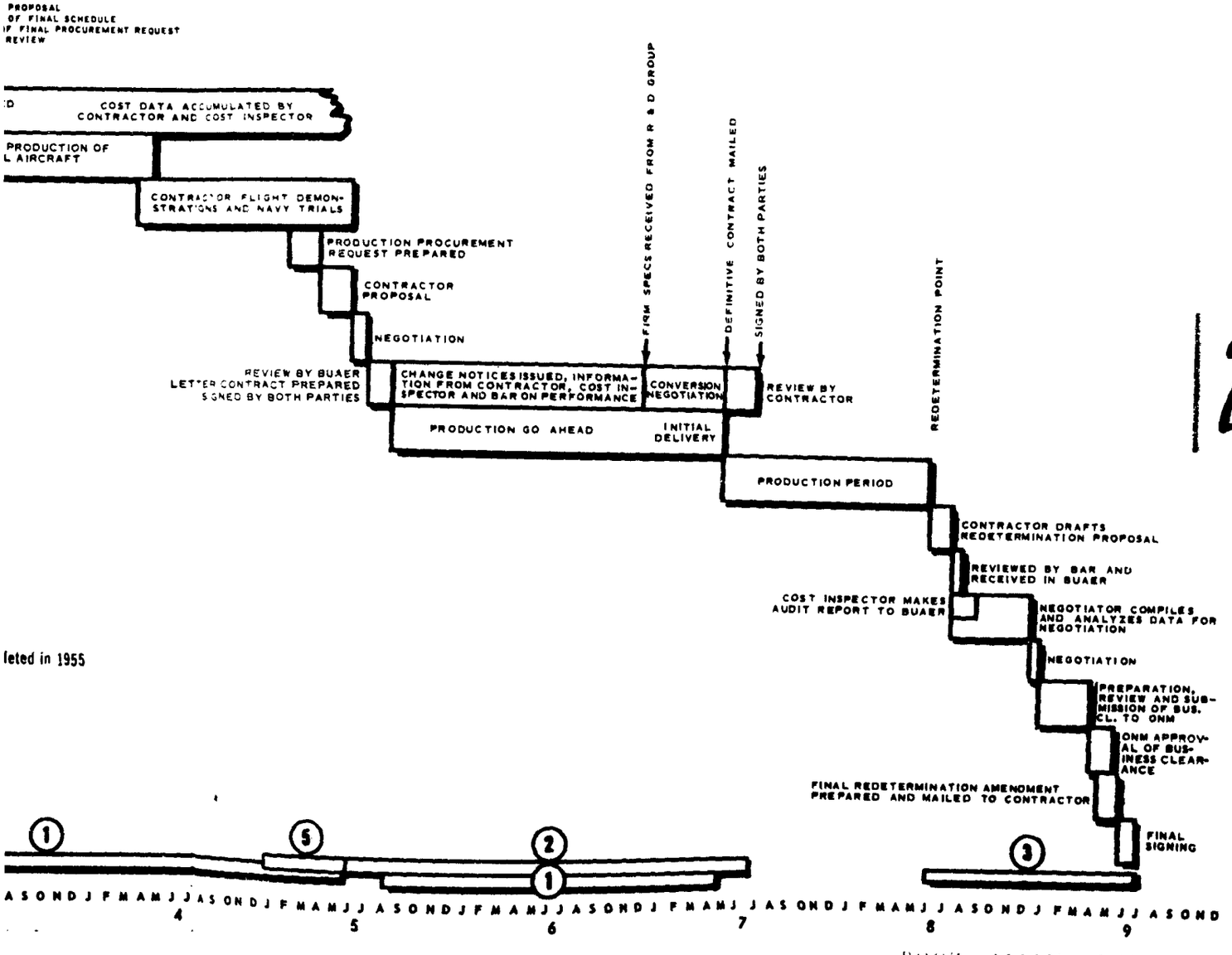
(4) ONM report statistics

(5) BUAER instruction 4310.1A

EXHIBIT II

BUREAU OF AERONAUTICS
DEPARTMENT OF THE NAVY

REPRESENTATIVE TIME CYCLE OF THE CONTRACTING FUNCTION- FROM EXPERIMENTAL MODEL TO FINAL CONTRACT REDETERMINATION



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BOOZ · ALLEN & HAMILTON

In order to assure fast deliveries and economical production costs, aircraft design has to be "frozen" at a reasonably early date. Ideally, the most efficient production can be achieved when no changes are introduced after manufacture has been started.

On the other hand, as new engineering data become available and higher performance capabilities come within reach, it is difficult, if not impossible, to ignore them, or to justify continuing the production of an aircraft of known obsolescence.

The Navy's Fleet Introductory Replacement Model (FIRM) plan is, at least, a partial answer to this conflict. The plan seeks to make the most reasonable compromise between these divergent interests by telescoping the time cycle from nine to about five or six years.

Under the FIRM plan, only a limited number of aircraft are built initially for test purposes. These units are built on regular production tooling. After thorough test and approval, gradual production build-up may be authorized.

The FIRM plan is intended to provide tested and qualified production aircraft for fleet service sooner than might otherwise be achieved. It may aid earlier decision-making as to which

aircraft of competitive design to put into production. It may permit incorporating design improvements more easily into aircraft at an earlier time, before they are committed to volume production. It tends to establish production capability at the earliest feasible stage in the development of a new aircraft model. On the other hand, it complicates orderly and efficient contracting operations.

This effect of the FIRM plan on the contracting function is discussed in detail in Chapter III.

(5) Contracts Express and Enforce National Policy, or May Be Used, in Effect, To Establish National Policy

Only to the degree that policy has been clearly spelled out and is understood at every level concerned can it be effectively interpreted and enforced.

Congress has established policy in at least two broad procurement areas: (1) prevention of unwarranted profits resulting from defense contracting and use of government facilities, and (2) the impact of the aircraft industry on the national economy. The Vinson-Trammell, Armed Services Procurement, Buy America, Renegotiation and Walsh-Healy acts, for example, are all explicit of national policy. These and related policy provisions have been or are included as clauses in aircraft contracts.

The more fundamental relationship of the industry and the economy, however, is only partially and imperfectly covered by policy. An essential area for which no policy guidance is provided is the relationship of aircraft procurement to the overall stability of the aircraft industry. A corollary area is the relative support to be given to the industry in order to assure the required mobilization base; and the manner in which this support is to be implemented, i.e., through limited production contracts, maintenance of status contracts, or otherwise.

The lack of this guidance interferes with effective aircraft programing and planning. It affects efficient use of the FIRM plan. The lack of firm policy introduces confusion and indecision into the contracting function. Since the contracting function is ultimately an expression of existing government policy, it must also inevitably reflect the lack or transcience of policy.

Aircraft procurement is a going business. Pressures of time and circumstances will not allow the process to slow down while policy catches up with it. As a result, the paradoxical situation frequently occurs wherein BuAer contract negotiators, of necessity, write into a contract matters affecting national policy that is the responsibility of higher authority. This is done because, in the absence of guidance from higher authority,

and still faced with the need to complete action within a scheduled deadline set by the Chief of Naval Operations, the negotiators necessarily crystallize policy matters by contract that previously may have been undecided, vague or without precedent.

A variety of examples bear out the use of contracts to establish policy, in effect, where none had been previously established. Among these are:

1. Definition of costs that will be allowed in incentive fixed-price contracts.

2. Allowance of overhead rates to high cost producers which permits them to stay in business for mobilization base purposes.

3. Financing and influencing research and development programs by permitting or limiting use of production funds for them.

4. Providing contractors long-range and future business opportunities by agreeing to absorb research and development costs as increased current overhead.

Policy in these and related areas is clearly needed to guide the aircraft contracting function.

(6) <u>The Ultimate Success of the Procurement Process Is Influenced Basically by Total Air Power Demands Placed upon the Aircraft Industry</u>

An urgent policy need at present is for firm guidance of the relationship of the procurement process to the over-all

stability of the aircraft industry. The very difficulty of establishing this policy itself points up the need for it.

A variety of insistent pressures surround the procurement process and the contracting function. In addition to those already discussed, two very strong forces are the desires of aircraft companies to stay in business; and the traditional belief, now being critically re-examined by military planners but still a widely held view, that there must be a finite and dependable mobilization base in existence to meet emergency military needs. This view is in conflict with the present situation wherein total industry capacity currently exceeds the present and immediate future needs of the military.

Modern weapons have drastically altered the classical concept of mobilization wherein time was sufficient after the onset of an emergency to build up the national production potential. The advent of supersonic missiles is one strong argument against the classical concept and for the idea of maintaining a military force in being that is immediately equal to handling any emergency.

The cost of the "force in being," however, would be high. Large engineering forces and extensive production facilities would be required, for example, to keep the air arm supplied

with a large, constantly up-dated inventory of advanced weapons. As a consequence, the military budget would still be the major factor in the national economy as procurement continued at a high level.

Deployment, utilization, maintenance and early obsolescence of an expanding inventory would be additional cost factors that would apply to the force in being.

Alternatively, the pace of aircraft and missile development could be slowed. Aircraft in service could be continued in service for longer periods without replacement by more advanced models. Research and development might be confined to relatively few experimental units and models. Production facilities might be confined mainly to maintenance, repair and overhaul of existing service models.

In this case, the aircraft industry would shrink to the few companies that might achieve support from commercial aviation. The ingenuity, initiative and scientific daring that has long characterized the aircraft industry, and which has contributed to the sense of national security, might, to a significant degree, become frustrated and disappear. The burden of maintaining the air arm technically superior to all comers would fall even more heavily and exclusively than now on the military departments.

Other possible alternatives for achieving stabilization of the aircraft industry for national security purposes are:

1. Keep all present aircraft companies in business regardless of the foreseeable need for them or their respective costs to the government, because they do provide a firm industrial mobilization base, and because they are an important factor in the national labor employment picture.

2. Control the stability of the aircraft industry through tighter control of funds appropriated for aircraft production purposes, and enforce strong competitive measures that might force some marginal companies out of business.

3. Through tighter control of program funds, contractor overhead rates, and by similar devices, force all aircraft companies to retrench in personnel and scope of operations.

To some extent these and other possibilities have been put into effect in specific instances through the contracting function. They constituted national policy for the time and purpose represented by that particular contract. At another time, with the same or other parties involved, the policy arrived at might have been quite different.

The confusion that is felt in the industry is that the policy, whatever it may be, does not remain sufficiently stable over a long enough period for it to be known, understood, or its effects comprehended. It is the lack or inconsistency of policy, rather than the repressive or restrictive nature of military aircraft

procurement, that characterizes the process both for the contracting function and the contractor.

(7) Competition in the Aircraft Industry Occurs Primarily at the Design Proposal Stage of an Aircraft Development Program

The cost of an aircraft development program, the cost to put the aircraft into production, the time involved, and the specialized knowledge and experience gained in the process all tend to give the contractor who initiates a program a real, practical advantage over any other prospective contractor for the same job. Once an aircraft is started into production, even at the experimental stage, for all practical purposes competition between prospective contractors no longer exists.

Competition does exist, however, at the design proposal stage. The elements of this competition, which precede the actual start of a program, are:

1. Identification of a present or potential military operational requirement.
2. Proposal of a new or better solution of an existing operational problem.
3. Improvement or extension of capability of a present aircraft.
4. A design proposal, suggested by the contractor or in response to request by BuAer, of a possible new aircraft.

Each of these elements centers on the research and development capabilities of the prospective contractors and on the ability of the contractors' engineers to demonstrate to BuAer engineers and other Navy officers that their design proposal is the optimum technical solution to the problem.

Design is the major factor in contractor selection. Manufacturing costs, past cost performance, service to the customer and such other factors which are directly related to commercial competition are not important to the same degree in the opening stages of an aircraft procurement program. They are, rather, matters to be considered later on during subsequent contract negotiations.

In effect then, contractors compete for an entire aircraft program at the outset through their design effort. Once they acquire the initial contract, competitive factors within the industry are not likely to cause them to lose the program to another company.

The Navy, for any number of reasons, may not continue a program, or may select another aircraft model as a preferable one with which to go into long-range production. One reason for this selection may be the comparative costs of similar aircraft developments. More often than not, however, the major

factors in a selection between alternative aircraft models are technical, i.e., related to mission performance, rather than to competitive production costs.

(8) The Nature of Small Missile Procurement Appears To Be Significantly Different from Manned Aircraft Procurement in Several Respects

On the basis of the single inquiry made into the Sparrow III missile during this study, it appears that stronger competitive pressures may apply to missiles of the Sparrow variety. Inherently, they are more nearly like small electronic or radar devices. There is considerable production experience available or readily adaptable for their manufacture. They are subject to mass production handling, unit quantities are high, and manufacturing operations are repetitive. These operations are more easily learned and transferred from one plant to another than are aircraft manufacturing skills.

Manufacturing facilities for these missiles are more readily and economically reproducible in different geographical locations. Finally, once the design has been "frozen," the requirement for continuing engineering attention is, or should be, considerably less. Because of these differences between missiles and manned aircraft, and because the major interest in this study centers on

aircraft programs, the balance of this and subsequent chapters focuses mainly on aircraft procurement.

The preceding paragraphs have described the industry, aircraft and government aspects of procurement that affect the nature of aircraft procurement. These factors combine to form the environment in which the contracting function operates. Another factor that contributes to the environment is the motivation and needs of BuAer in relation to aircraft procurement. These are discussed in the following section.

3. MOTIVATION AND NEEDS OF THE BUREAU OF AERONAUTICS

A strongly influencing factor in the procurement process--one that helps to set the tenor of Navy relationships with industry--is the fundamental motivation of the Bureau. It is important to recognize in relation to the contracting function why BuAer enters into a relationship with industry in the first place, what it seeks to accomplish thereby, and what basic factors affect this relation. These matters are discussed in the paragraphs that follow.

(1) BuAer's Fundamental Motive Is To Supply the Fleet with the Best Aircraft When Needed at the Lowest Ultimate Cost to the Navy

The primary motivation of BuAer is to supply the best air weapons where and when needed to enable the Navy to carry out

its assigned missions. Because of its public trust, BuAer is moved to achieve its goal at the lowest ultimate cost to the Navy consistent with defense objectives.

The reference to lowest ultimate cost carries with it the need for an aircraft design that can provide long service life, requires no unusual maintenance handling, and for which extensive grounding for modification or major change is unnecessary.

The Bureau is aware of its impact on the aircraft industry and on a large segment of the national economy as well. Nevertheless, its chief obligations are to assist in providing for the national defense.

In order to meet these requirements, it must fulfill certain additional basic needs which are identified in the following paragraphs.

(2) <u>BuAer Needs To Stay Abreast of Advancing Science and Technology</u>

The past two decades have witnessed an unprecedented leap forward in scientific and technologic knowledge. Every field bearing on naval aircraft has been touched by this progress. Every advance has raised new questions affecting airframes, propulsion, electronics and controls that require new answers.

BuAer is seeking the new answers it needs by supporting aircraft research, development and engineering efforts by naval and contractor personnel.

(3) BuAer Needs To Stay in Advance of Enemy Capabilities in Naval Warfare

A strong stimulus to BuAer aviation research and development of more advanced aircraft is the pressure of progress made in other countries.

Technical intelligence and other sources of information keep BuAer alert to the forces which may oppose the naval air arm. Under the guidance of the military leadership provided by the Department of the Navy, the Bureau has a continuous need to convert new operational requirements into models, types and quantities of aircraft that will meet defense objectives.

In meeting this need the Navy is dependent upon the resources of the aircraft industry.

(4) BuAer Needs To Be Quickly Responsive to Changing Fleet Operational Requirements and Combat Plans

Military plans and doctrine require a fluidity and adaptability that matches the temper of the times. Availability of new weapons, shifts in geographical centers of potential military

importance and new knowledge in military strategy and tactics directly and indirectly upset accustomed operational requirements and combat plans. Inevitably, the procurement of naval aircraft is affected.

Aircraft mission requirements may change quickly. Longer range, higher performance, different armament capability or a variety of other attributes may be called for. A new research and development and production program may have to be started to satisfy the need.

The responsiveness that is needed to support changing defense requirements can come only in part from the Navy. A major share must be provided by industry. An effective partnership of effort is needed between BuAer and contractors to assure achievement of the established defense goals. The contracting function is clearly a part of this partnership effort.

It is evident that achievement of BuAer's objectives depends upon a partnership of effort that includes the aircraft industry. Complete domination of the industry might assure that the Navy's objectives would be satisfied, but this is not the course that has been taken in this country. However dependent on government the industry is for survival, it is nevertheless structured on the framework of independent industrial

management. For this reason and others discussed in the next section, the motivations and needs of aircraft contractors are also important considerations in the contracting function.

4. MOTIVATION AND NEEDS OF THE AIRCRAFT INDUSTRY

The goals and needs of individual aircraft contractors are sufficiently similar in their fundamental aspect to permit expression as those of the industry at large. From this point of view they take on added significance. The industry involves large sections of population, manufacturing skills and professional talents, and indeed, a considerable share of the national economy.

It is of immediate interest to the Navy, therefore, to assure the well being and vitality of the industry. Through the industry's resources the Navy achieves its own goals. Consequently, the following discussions of industry motivation and needs is pertinent to the study of the contracting function:

(1) The Primary Motive of Aircraft Companies Is To Stay in Business

In the face of government controls, absence or change of government policy, economic and other pressures that apply and the high rate of aircraft obsolescence, staying in business

on a sound basis today is a perilous challenge for most aircraft companies.

The central objective of most aircraft companies is to strengthen their relative position in the industry and in the economy of the country. In order to achieve this goal, their needs are to:

1. Possess and utilize the material, production and human resources required to satisfy the Navy's aircraft requirements.

2. Earn and retain profits on operations.

3. Promote the business growth of the company.

These three needs are discussed briefly in the following paragraphs.

1. Resources

The nature of the aircraft product requires extensive plant facilities, specialized equipment, and large numbers of skilled and professional people. The money needed to support these elements normally exceeds any company's ability to supply it out of its own funds or to attract it from capital investors. Financial institutions do not consider aircraft companies sufficiently stable risks to warrant their underwriting the cost of an entire aircraft production program. It follows, therefore, that directly or indirectly the government must provide for a large portion of plant, facilities, equipment and working capital.

2. Profit

Profit is both the reward and the challenge of business operations. It is a measure of the management skill and the earning power of a company. It is an effective incentive in most cases to encourage superior contractor performance. Conversely, the loss of profit can dull performance incentive.

The President's Air Policy Commission (1948) reported that "a profitable company will attract capital and credit. It will be able to employ and retain the most capable engineers and craftsmen. The concern which consistently loses money will deteriorate, its financial position will weaken, and the quality of its product will suffer as its best employees drift away in search of better opportunities."

3. Growth

Several aircraft contractors have sought business growth and stability through diversification into commercial aircraft and nonaircraft products. No major company, in its present form, however, has yet achieved or is likely to achieve independence from its military business.

The characteristics of the industry and government controls are not likely to encourage business growth through acquisition or merger involving other major aircraft companies. They are also unlikely to encourage diversification on a wide scale by aircraft companies generally undertaking the design and production of all types of aircraft.

The type of business growth that appears to be most applicable to the aircraft industry is that achieved through science and technology in the areas of new aircraft designs and production processes.

(2) The Major Risk Aircraft Contractors Feel Is Loss of Technical Reputation and Follow-on Production Business

> Risk may be defined as the chance or probability of loss. The loss may be financial or of any other nature.

Risk has a variety of particular and controversial meanings and significances in the aircraft industry. From one point of view, the contractor has little risk. That is, he has little or no expectation of financial loss. Since the government may supply plant, facilities, equipment, cost reimbursements, price protection and progress payments, little of the contractor's capital is tied up in the success or failure of the program.

With regard to specifications and performance guarantees, the government has been frequently willing to make a reasonable adjustment in view of the state of the art and the contractor's best efforts. Although this risk is of uncertain dimensions, in the past it has not been high. More strict enforcement of performance guarantees would increase the contractor's risk.

In cost-type contracts, the contractor runs no risk of loss of fee, and all of his costs (allowed under Section XV of the Armed Services Procurement Regulation) are reimbursed to him.

Up to the present, aircraft contractors have had some assurance that the government will keep them in business, if only for mobilization base purposes. Thus, they have had little risk of severe consequences of any poor performance on their part.

On the other hand, contractors feel that aircraft contracts do not give adequate recognition to those risks that are a substantial part of doing business with the government even though immediate cash loss may not be involved.

In the aircraft industry, where the state of the art is continually being pushed forward, and "research is being done on a mass production basis" the unknowns and pitfalls are numerous. The chance of not finding a good technical solution in reasonable time is a real risk.

Poor aircraft design or performance can detract seriously from a contractor's reputation. It can cost him his customer's confidence in his basic ability. Since the aircraft business is essentially an engineering business, the loss of technical reputation carries with it the threat of loss of business-getting capability and follow-on production contracts.

Other risks that aircraft contractors feel strongly include the unexpected program terminations due to abrupt changes in defense planning. The recent series of program cancellations, terminations and stretch-outs ordered by the Department of Defense is an example of this risk. Although termination settlements may be financially adequate, they do not alter the necessity for a contractor to make sudden and far-reaching adjustments to his business plans and operations.

Numerous other risks exist, including the necessity on the part of a prime contractor to integrate into his weapon system GFE which may be of marginal operating quality, reduction of progress payment amounts, as has recently occurred, and the nonreimbursement of business expenses such as the cost of money borrowed to keep aircraft programs going in anticipation of contractual documentation. In this last regard, a recent change of Department of Defense policy allows a somewhat higher percentage of profit in lieu of the cost of borrowing such funds. It is still too early to assess the effect on risk of this new policy.

Certain of these risks, such as the experimental characteristics of aircraft development, are inherent in the nature of the procurement. To the extent they exist they must be appraised and evaluated by the contracting function during the contract negotiation process.

Other risks are implicit in the "hazards of doing business with the government." They tend to be more administrative in nature, but are nevertheless real. Sudden contract termination or an unexpected cost disallowance are examples of this risk. Not all of these risks can be eliminated, but many can be reduced in their impact upon the contractor through improvement in the way the procurement process is implemented.

It can be summarized that risks in the aircraft industry are of three basic types:

1. Financial Risks, or the risks of financial loss on individual contracts or that covering a year's business.

2. Technical Risks, or the risks of failure to achieve a technical goal or to produce a technically acceptable aircraft.

3. Risks or Uncertainties in Doing Business with the Military, and the attendant possibilities of cutbacks, changes in program and the controls and limitations that are exercised by government agencies.

(3) Contractors Need a Close Correlation between Profit and Contract Performance and Risk

> Profit may be defined as the excess of income over expenditures, or of proceeds over costs.

Normally, both the amount and rate of profit measure the excellence of management skill and performance. They are a

reward for entreprenurial risks taken. If they have a stable or growth characteristic for a company, they encourage public confidence and attract capital investment.

In view of the recent Department of Defense directives that reduce progress payments and limit cost reimbursement to 80% of incurred costs, additional capital becomes a critical item for most, if not all, aircraft contractors. The attraction of profit earning capability for investment funds becomes all the more important.

The normal business incentive is to promote growth of profit. On the other hand, public antagonism toward excessive profit in government contracting is well established. A major effort in the contracting process is to resolve this basic conflict and establish "fair and reasonable" profit.

A major difficulty that impedes reaching quick agreement between BuAer negotiator and contractor on profit is the fact that the negotiation process characteristically tends to set profit factors before the risks of the contract are undertaken, before work is performed, and before the total impact of the contract on the entire business of the contractor can be known. This is in contrast to the commercial situation where profit generally

is the result of an operation, and the ultimate profit rate is unknown prior to the start of the effort.

In the commercial situation, profit is limited mainly by market considerations, competitive pressures and internal management capabilities. In most aircraft procurement situations these factors are subordinated to the legal restrictions on profit and to the entire process of negotiation.

In cost-reimbursement type contracts, financial risk is presumed to have been totally assumed by the government. Profit, therefore, is reduced to the status of a fixed fee which is paid to the contractor for management and technical services to be rendered, and for the use of such capital, plant and machinery as are to be supplied by the contractor. Fee is related to the estimated cost of the contract. The maximum allowable fee is set by law and regulation.

In price-type contracts (fixed, redeterminable or incentive) government and contractor respectively share varying amounts of financial risk, and profit is determined accordingly. In this case, the identification of the factors that contribute to determining profit, and the criteria by which to measure each component of risk is uncertain or missing. There is no systematic

or agreed upon method for establishing profit other than by negotiation.

The net effect of the opposing points of view of government negotiator and contractor toward profit (the one being vulnerable to Congressional criticism if profit appears to be too high, and the other subject to the pressure of the owners of the business if profit is too low) makes this item a main point of considerable controversy. Profit tends to be emphasized more than ultimate cost in negotiations. It is tied to contract costs as a percentage of that amount without adequate recognition that contractor performance along with risk is a prime criterion of the reasonableness of profit.

(4) <u>The Opportunity To Earn and Retain a Major Additional Profit through Follow-on Production Is Incentive to Aircraft Contractors</u>

> Incentive may be defined as the stimulus existing or established within a total contracting action (not only within contract clauses) that motivates and encourages a contractor to perform so as to produce superior results.

Profit is, of course, a fundamental incentive to aircraft company managements. It is not, however, the only major incentive that operates in the aircraft industry.

The drive to stay in business, particularly in the present period of adjustment of the Federal budget, is a real, tangible pressure. The opportunity to acquire long-range follow-on production contracts is, therefore, a strong incentive.

Maintaining and promoting an outstanding record and reputation for technical excellence and ingenuity is an equally strong incentive. It is important for business-getting purposes since competition in the aircraft industry is primarily in the technical field. It is important too, from the point of view of attracting other scientists and engineers to the company so as to increase further the company's business handling capability.

In major part, the motivation and needs which have been discussed in the foregoing paragraphs are oriented toward the contractor's responsibility to the owners and employees of the business. The further responsibilities of the contractor to the customer, the Navy, are discussed in the following section.

5. BASIC CONTRACTOR RESPONSIBILITIES

Because of the nature of the aircraft procurement process and, because of the importance of the work they do, aircraft contractors undertake serious burdens and obligations. They are numerous and extend in scope from the basic aircraft design to the utilization of resources, control of costs and guarantee of quality.

During the course of this study it became evident that certain of the contractors' basic responsibilities were significant with respect to the aircraft contracting function. In particular, there were some that had not been lived up to in full measure. As a result, significant procurement and contracting problems have been created. These items are discussed in the following paragraphs.

(1) Contractors' Responsibilities to BuAer Begin with the Submission of the Design Proposal

The design proposal stage is generally the opening phase in the BuAer-contractor relationship. It may be preceded by discussions, presentations and even research investigations. These initial steps, however, culminate in the development, preparation and submission of a total design by which the contractor proposes to solve a Navy operational requirement.

At times, in the past, contractors have not fulfilled these responsibilities. Design proposals have been submitted with exaggerated claims in an aggressive effort to win a design competition. At least in the case of one contractor, he anticipated that there would be sufficient time after the contract award for his engineers to develop an aircraft design that would actually perform as well as his proposal claimed it would. If he were not successful in finding such a design, he anticipated that he

could negotiate later with BuAer engineers for more lenient specification requirements. There is no evidence that he was successful in this attempt.

(2) Contractors Have a Fundamental Responsibility To Develop and Submit Sound Cost Estimates

Circumstances that surround contract negotiations, renegotiations and price redeterminations have caused some contractor personnel to view cost estimating somewhat cynically. Expecting BuAer negotiators to look for cost cutting opportunities in their price proposals, some contractors have admitted that at times they have deliberately overstated cost estimates. They have also at times understated costs in hope of acquiring a contract for work.

At other times, either because insufficient time or experience was available to make detailed cost analyses, "guesstimates," rather than valid cost estimates, have been submitted to BuAer negotiators, and then staunchly defended as though based on fact. There are still other cases where cost estimating apparently was carelessly done. Informal pricing audits made by Navy Audit Office auditors have been helpful to both contractors and BuAer in isolating and correcting such errors.

In some instances, where a BuAer negotiator may drive too hard a bargain, it is conceivable that contractors will include contingency sums, that otherwise would be disallowed, into some inconspicuous contract item.

These examples are not cited to lay blame either on the contractor or on BuAer, nor do they suggest that "negotiation is a shield for mischief." The purpose, rather, is to point up the need to dispel any aura of suspicion between BuAer and its contractors and to get down to a fundamental basis of mutual trust. This can be done by contractors undertaking fully their responsibility for sound cost estimates, based on demonstrable facts and good business judgment.

(3) Contractors Share Responsibility with BuAer for the Control of Engineering Changes

Engineering design changes are a major factor in adding cost, confusion and delay to an aircraft procurement program.

Changes may be caused by a change of aircraft mission, the availability of a new subsystem or the opportunity to achieve a basic system improvement. They may also be caused by engineering errors, lack of design forethought or an opportunity for the contractor to recoup cost overruns. They may be also used to take advantage of allocated funds that become available on a

contract because of the working of the incentive features that reduce actual cost below the originally estimated cost.

Changes may be generated by the contractor, BuAer engineers, inspection boards, fleet users and BAR's. Regardless of the cause or the source, the contractor has a responsibility to keep changes to a minimum.

Along with BuAer, the contractors should exercise strong controls over engineering changes to eliminate all but the few that are really necessary.

(4) Contractors Have a Basic Responsibility To Satisfy Performance Guarantees

Design and performance specifications represent the Navy's interpretation of the operational requirements that established the need for an aircraft in the first place. They not only guide the development and design of the aircraft, but they are also the criteria by which the performance of the aircraft can be measured.

A fundamental responsibility of the contractor is to work with BuAer engineers to make sure that these specifications are both realistic and attainable. After they have been formally established, they should represent the aircraft performance the contractor guarantees to provide in his production aircraft.

The contractor is responsible for assuring that the quality of his product is uniform and not less than that required for the full mission intended.

(5) Contractors Have a Basic Responsibility To Make Best Economic Utilization of the Resources Made Available to Them

The magnitude and scope of aircraft programs makes tight cost and utilization control difficult. Particularly where cost reimbursements are provided by the government, there may be some tendency on the part of a contractor to relax controls. Likewise, since the government is paying the bills, there is also a tendency to incur costs that would not be incurred in a commercial, competitive environment.

Neither the difficulty nor the disinclination to establish and maintain controls over costs, materials utilization, personnel hiring, personal amenities and related items should cause contractors to lose sight of their responsibility for good management. Contractor management should be alert continuously to prevent unnecessary expenditures and to avoid incurring costs which might not be undertaken in a nongovernment supported industry.

The conscientious performance of these basic responsibilities becomes even more important as the military services tend more toward giving contractors increased responsibility for integrating the airframe and all components into a complete weapon system.

Chapter II, which follows the recommendations contained in the next section, discusses the weapon system concept and its impact on the contracting function.

RECOMMENDATIONS

PREREQUISITES FOR EFFECTIVE BUAER-CONTRACTOR RELATIONSHIPS

The Navy and the aircraft industry are dependent upon each other for the realization of their own objectives. The Navy needs the contractors' technical and production resources in order to deliver to the fleet the best aircraft, in the time and quantity required, with which to meet defense objectives. Contractors, on the other hand, need the Navy in order to stay in business.

It serves the interests of both Navy and industry for BuAer and the contractors to develop and maintain the most favorable and effective working relationship possible. The chief prerequisites for this relationship include:

(1) A sound, firm national air defense procurement policy.

(2) A stable, resourceful aircraft industry.

(3) A business-like basis for the conduct of aircraft procurement.

(4) A sincere attitude of cooperation, respect and mutual trust shared alike by all levels and ranks of the Navy and industry.

These prerequisites for effective procurement relationship either do not now exist, or they do not exist to the necessary degree. In order to achieve them, the following actions are recommended.

1. PRESS FOR THE ESTABLISHMENT OF COMPREHENSIVE NATIONAL AIR DEFENSE PROCUREMENT POLICY AS THE FOUNDATION FOR EFFECTIVE INDUSTRY RELATIONSHIPS AND ECONOMIC AIRCRAFT PROCUREMENT

Several attempts have been made over the years to establish national air policy. One of these was the Congressional Aviation Policy Board (Brewster Committee) which submitted its report to the Congress on March 1, 1948. Among its highlights, the report included these thoughts:

> "In the interest of national security, there shall be provided overlapping of design and production contracts to provide continuity of labor; to obtain economy in procurement; and to assure the availability of expandable engineering and production teams in industry.
>
> Maintenance of a healthy and expandable aircraft industry is required for national security.
>
> Military purchases are 90 per cent of total production; therefore, stability of the industry depends on wise procurement planning by the Armed Forces.
>
> Presently, the Services rarely are able to inform the manufacturers of their procurement programs far in advance. Future delivery schedules are for comparatively short periods and do not provide for overlapping of design and production contracts. This results from lack of long-range planning and inflexible procurement laws, as well as the constitutional limitation on appropriation of moneys beyond one Congress.

To be secure, this Nation needs an industry with sufficient production to maintain a nucleus of facilities and engineering and production staffs to permit rapid emergency expansion."

Neither the Brewster Committee's report, the report of the President's Air Policy Commission in 1948, nor the other attempts that have since been made to establish national aviation policy have yet been fully implemented.

The direct result of this lack is the absence of firm coherent national policies covering air defense and air defense procurement. Each of these policies is successively dependent upon the prior establishment of the other. The one has real significance only in context with the other. Taken all together, these policies provide the framework for effective long-range planning for most economical utilization of the human, economic and material resources of the aircraft industry.

The establishment of national air defense procurement policy is essential for maximum effectiveness of the aircraft contracting function. The Secretary of the Navy in conjunction with the Secretaries of the Air Force and Army should present their recommendations in this regard to the Secretary of Defense. Further presentation by the Secretary of Defense to the National Security Council and/or the Congress may be necessary.

2. SUPPORT STABILIZATION OF THE AIRCRAFT INDUSTRY TO THE DEGREE NECESSARY TO ASSURE AN ADEQUATE MOBILIZATION BASE

The Bureau of Aeronautics alone cannot create a stable aircraft industry, nor would it be the only agency to benefit from industrial stability. Therefore, BuAer, along with other ranking echelons of the Navy, should join with the Air Force and the Army to achieve the degree of industry stability that will best assure attainment of the assigned objectives of each of the services.

One avenue of approach to achieving this stability is for each of the services to interpret its long-range aircraft plans and requirements into specific types of aircraft. Each type, along with its projected quantity, should be related to its engineering and production workload impact upon industry, and upon the specific specialized parts of the industry most likely to be equipped to handle the requirement. The combined service requirements should then be correlated with the available industry capacity and prospectively allocated program funds. This correlation should probably be done in the Office of the Secretary of Defense. The total requirements should be reviewed in terms of national air defense procurement policy. Allocations of industrial capacity to meet each service's long-range needs should then be made on an equitable basis by the Secretary of Defense.

Some such long-range consolidated aircraft planning may be done at present at the Secretary of Defense level. The results of such planning, if done, however, have not been apparent in this investigation.

In any event, the Chief of the Bureau of Aeronautics should make sure at all times, through up-to-date reports and analyses of the industry, that Navy aircraft contractors have the physical and economic size, resources and capabilities to meet the Navy's air arm needs on a reasonably economical basis.

The industry support that is suggested, however, should not go so far as direct government subsidization. On the contrary, competition and individual initiative among aircraft companies should be preserved and promoted along present lines. To the maximum degree practicable, the principles of free, rather than captive, enterprise should be fostered throughout the aircraft industry.

Once this step is taken, it will be necessary to bring all levels of procurement policy and regulations in consonance with this program. This subsequent move will require action by the Secretary of Defense, the Chief of Naval Material and, possibly of the Congress. The Office of the Secretary of Defense, however, should assume total responsibility for assuring that the necessary changes are made to the various policies and directives involved.

3. ESTABLISH A MORE EFFECTIVE PARTNERSHIP WITH CONTRACTORS IN RECOGNITION OF THE INTERDEPENDENCE OF NAVY AND INDUSTRY

Along with industry, the Chief, BuAer should work toward developing an operating pattern for the Bureau in the middle ground between the strictly commercial buyer-seller relationship, which may not be realistic, and the opposite extreme of complete domination of the aircraft industry, which is not desirable.

To this end the Chief, BuAer should take steps to place the procurement process on a more business-like basis with contractors. These steps should include setting up well-defined and published contractor performance criteria; providing contractors an opportunity to gain more current knowledge of the Navy's forward plans for their own planning purposes and, in particular, instilling in Bureau personnel an attitude toward contractors of respect and confidence, rather than suspicion.

In addition, a two level review and re-evaluation should be made of the variety of regulations, directives, orders and procedures that apply to aircraft procurement. The Chief, BuAer and the Chief of Naval Material, at their respective levels, should direct this study to identify and eliminate duplications, conflicts, and vagueness in these proscriptions. To the maximum extent possible, instructions

and practices should be simplified to encourage, not impede, good BuAer-contractor working relationships.

As a result of his review, the Chief, BuAer should inform the Chief of Naval Material of the changes or interpretations of the Armed Services Procurement Regulation and Navy Procurement Directives needed by the Bureau in aircraft procurement to secure more effective contractor partnership. BuAer should press for the desired modifications.

Obviously, partnership is a two-sided affair. As previously pointed out, contractors likewise have a basic responsibility for effective relationship on their part.

The subject of BuAer--contractor partnership, which is presented here for background purposes, is discussed in greater detail in the next chapter.

4. CONTINUE AND EXPAND BUAER'S PROGRAM TO TAKE INDUSTRY LEADERS INTO GREATER CONFIDENCE REGARDING NAVY LONG-RANGE PROCUREMENT PLANS

The Chief, BuAer should encourage top BuAer officials and leaders of the aircraft industry to increase their participation in frank exchanges of ideas and in formulation of long-range procurement plans. Meetings, such as that held in October 1957 in the office of the Chief, BuAer with top executives of the aircraft industry, should

be expanded and continued on at least a semiannual basis. The subjects of these meetings should be discussion of Navy requirements, plans, programs, policy interpretations and exchange of ideas on mutual problems. These meetings should foster the recognition of the wide community of mutual interests between Navy and industry.

In addition, presidents and other top executives of contractor companies should meet in occasional sessions with the Secretary, Assistant Secretaries and other policy determining officials of the Department of the Navy who are concerned with the various aspects of aircraft procurement. These periods should be used to discuss such items as fund limitations, programs to be initiated, criteria for contractor selection and new and revised interpretation of Department of Defense policies.

The benefits to be gained from such conferences include the development of a habit of working together, the building of a cooperative atmosphere and the provision of an adequate basis for both procurement and industrial planning.

* * * *

The foregoing prerequisites summarize the chief factors that appear to be necessary to assure a really effective procurement

relationship with industry. It is clear with respect to many of these items, BuAer can only initiate action or encourage the interest of higher authority. Final results depend upon the Department of Defense and upon the Congress, particularly where fundamental national policy is concerned.

The next chapter discusses the concept of weapon system management and procurement.

II. THE WEAPON SYSTEM CONCEPT

II. THE WEAPON SYSTEM CONCEPT

Modern warfare and weapons are causing a reappraisal to be made of the traditional roles of BuAer and its contractors. As a matter of practical necessity, BuAer is having to take a new look at the total job that has to be done and at its own capability to do that job.

Modern weapons are achieving new orders of complication. Their components stem from different highly specialized fields of science and technology. Nevertheless, they must merge into a single system of mutually dependent and coordinated parts. The job of integrating the parts into an operational system--never an easy task--has taken on new complexities. More highly trained and competent engineers and administrators are needed for management of the programs that evolve weapon systems. This fact, combined with the increasing operational and administrative load on BuAer, adds to the total problem of staffing the bureau with the number of qualified people required to do the entire job for which it is responsible.

The alternatives available to BuAer are to:

(1) Continue as at present with its forces spread thinly across a total job that daily becomes more perplexing and even more vital to the nation.

(2) Reduce the total job to the really essential tasks that must be done; assign those tasks to whoever is best fitted to perform them most successfully.

The second alternative is clearly the more desirable. However, it requires new roles for BuAer and for its prime contractors. BuAer can no longer afford to enmesh itself in procurement details to the extent it has in the past. Its primary role now should be one of over-all program planning and contractor monitorship. The Bureau should give major emphasis to its functions of master planning, scheduling, policy guidance and over-all performance measurement.

On the part of the prime contractor, his role should make available the management experience, technical coordination and system engineering and integration capabilities that are the essential ingredients and particular attributes of his business.

The balance of this chapter is given to a consideration of the concept of the weapon system and its related details. Weapon system

management and procurement, Air Force and Navy applications of the weapon system concept, and the impact of the concept on future aircraft procurement are discussed in successive sections. Recommendations regarding Navy application of the weapon system concept are presented at the end of the chapter.

1. WEAPON SYSTEM MANAGEMENT AND PROCUREMENT

The following paragraphs define the components of the weapon system concept as applied to aircraft procurement.

(1) The Weapon System Is a Self-Sufficient Unit of Combat Striking Power

Necessities of modern warfare require that a new, advanced weapon be operationally complete when it enters fleet service. In the broadest military sense, the weapon must be supplied along with all related equipment, materials, services and skills that make it a self-sufficient unit of striking power. All of these things together, integrated and conceived of as a single entity, is the weapon system.

For the purpose of this report, the weapon system is limited to the complete, operational aircraft. Ship and shore equipment, personnel and ancillary materials, for example, are not included in these procurement considerations.

By definition the weapon system must be an operationally ready unit capable of fulfilling its mission requirements immediately on call.

To this is added a third essential. The time required to develop, produce and supply a complete weapon system must be a minimum in order to assure that it will be available when needed.

This time requirement, in view of the complex and diverse components that make up a system, poses the major procurement problem under the weapon system concept.

(2) The Weapon System Approach Provides a Unified, Centralized Management and Procurement Control

Weapon system management is the unified control, guidance, coordination and direction that is applied to implement the concept.

This management may be applied at various levels. It may be applied at the Bureau level, where an assigned individual welds the fiscal, technical, supply, contractual and related phases of a program into a single, coordinated effort. It may also be applied at the contractor level, where an assigned individual integrates the engineering, manufacturing, financial, contract administration and other applicable functions into a single effort aimed at designing, producing and delivering a weapon item (a product).

Weapon system procurement is one aspect of the management function. It is a unified approach to the development and design of a weapon and its delivery in a combat-ready condition.

This procurement may be broad in scope and include not only the weapon item, but also all ancillary, support and related items under one design and purchase responsibility. It may also be limited in scope and cover only a portion of a total weapon item, for example, the electronics and warhead sections of a guided missile.

The common denominator in these definitions is that the weapon system approach provides a unified central control of the activity. Regardless of who supplies it, the military or a contractor, the central management feature is an essential.

(3) <u>The Services Have Not Yet Developed a Standard Pattern for Weapon System Management or Procurement</u>

There have been a variety of ways in which the weapon system concept has been applied in recent years by the three services. In the case of the Nike missile, the Army contracted with Bell Laboratories to develop the conceptual design and manage its development into a complete weapon. In the Bomarc missile, the Air Force retained over-all weapon system management and contracted for specific components of the system under

rigid design specifications. The Redstone missile was kept entirely "in-house" by the Army.

The more recent Air Force approach to weapon system procurement has put more management responsibility on the principal contractor. The B-58 program is an example of this. It is discussed later in this section and also in Appendix G.

The ICBM program, also discussed later in this section, is being handled in a manner more comparable to that of the Bomarc program.

The Navy approach has been to retain weapon system management responsibility itself, but to have the prime contractor take on more components procurement responsibility. Thus, in a Navy program, there may be more contractor furnished equipment (CFE) than government furnished equipment (GFE) in comparison with nonweapon system programs. Control and authority over CFE specifications, nevertheless, remains with BuAer.

The P6M and the Sparrow III programs are discussed later in this section and in Appendixes A and D, respectively, as examples of the Navy weapon system approach.

(4) The Weapon System Approach Recognizes the Management Function That Both the Military and Prime Contractors Have Provided in the Past

The weapon system concept is not a new principle. Prime aircraft contractors have generally had a deep interest in the total aircraft, and often have assumed responsibility in varying degrees for its performance and the operating compatibility of all its components. The military, on the other hand, has generally been the coordinating and integrating agent in a total procurement program. The difference in the present application of the concept is the desire on the part of both Navy and industry to establish and implement a better understanding and performance of their separate responsibilities.

(5) Successful Application of the Weapon System Concept Requires Definition of the Contractor's Responsibility and Commensurate Authority

The weapon system contractor may be defined as:

> The prime contractor to whom is assigned responsibility and authority for conceptual design of the total weapon system and the specification of all its parts, for integration of all its parts into a complete, organized, working system, and for demonstration that the performance of the system equals or exceeds operational requirements.

The weapon system contractor may be given responsibility for only a part of a total system, as in the case of Raytheon and

the Sparrow III missile unit. In this case, Raytheon is actually a subsystem contractor. Its responsibility covers the forward or electronics portion of the missile. Other contractors are responsible for the rocket motor and the warhead portions. Responsibility and authority for total system integration remains with BuAer Guided Missiles Division. BuAer is thus, in effect, the weapon system manager.

The weapon system contractor may also be given major management and procurement responsibility and authority as was Convair-Fort Worth in the Air Force B-58 program. The Air Force, nevertheless, retained control as the final review authority, advisor and partner in the program, and was manager of the military aspects of the program that were beyond Convair's development and production portion.

It is imperative that the responsibility and authority assigned to the weapon system contractor be spelled out in unequivocal terms. Both contractor and BuAer should have a clear understanding of what is to be expected from each. In cases where the weapon system concept has been applied in the past with little success, a prime reason has been the lack of clear job definition.

(6) The Weapon System Approach Is Most Effective for Procurement of Experimental Aircraft

The weapon system concept provides for a unified approach to the conceptual design and development of a new weapon. The starting point for design is the operational requirement for which the system is ultimately intended. The requirement is interpreted in terms of the best feasible technical solution, rather than in terms of necessarily adapting existing subsystems and components into an approximation of a solution.

A coordinated, integrated design of the entire system is the goal of this concept. Thus, all of its parts are designed from the beginning to work together at maximum effectiveness.

The development and test of the entire weapon system can be more readily controlled and directed because of the centralized system engineering responsibility that is established and is inherent in the concept.

Central technical management also makes it possible to review and interpret proposed technical changes from the standpoint of their total impact on the system, as well as from their need in a particular system component.

The weapon system concept is likely to encourage the development of superior weapons. Design engineers have greater freedom to exercise initiative and ingenuity. They also are in a better position to evaluate the details of their designs since they can appraise them at every step from the aspect of the total system.

The unified approach to weapon system development is likely to be saving of time. Under this concept, it should be possible to provide a greater degree of consistent management direction, decision-making facility and close work supervision. It should be possible to bring all phases of the development into closer coordination and effectiveness.

There is no valid evidence yet available to prove that the weapon system approach is any more costly, or less costly than a nonweapon system approach.

(7) Unresolved Production, Supply and Maintenance Problems Reduce the Effectiveness of Weapon System Procurement of Production Aircraft

Despite its evident advantages in research and development phases of procurement, a number of operating problems occur or might potentially occur in the application of the weapon system concept as a program moves into production. Chief among these are:

1. Equitable distribution of the total workload throughout industry.

Weapon system contractors might tend to expand their capacity and capability to keep a majority of the work "in-house."

2. Prevention of undue economic as well as geographic concentration of contractor plants and facilities.

A few weapon system contractors might control a majority of the total aircraft contracts.

3. Retention of industrial competition and opportunity for small business.

In an extreme case, weapon system contractors might establish tacit agreements to divide the available work and monopolize the output of subcontractors and parts suppliers.

4. Provision of a sufficiently diverse and widespread mobilization base.

Under the weapon system concept, industry might tend to contract physically and economically into fewer plant sites and concentrated facilities and resources.

5. Standardization of supply and maintenance items.

Numerous self-contained but entirely dissimilar weapons systems would require spare parts and maintenance for the duration of their service life thus adding significantly to the cost and complications of field support.

The weapon system approach is inherently in conflict with the services' attempts during recent years to achieve weapons and components standardization. Although the advantages of specialized weapons are evident, there would be additional costs to be met because of the necessity to stock a larger number of

nonstandard supply items. More storage space aboard ship and ashore would be required. Higher skilled and more specialized maintenance and supply personnel would also be needed.

Procurement under the weapon system concept would not do away with the necessity for parallel development and procurement of specialized components, as at present for engines, radar equipment and other long lead time items. It would be impractical to develop all new elements for a weapon system as though no prior knowledge existed. To do so would be to make the ultimate availability of a weapon system dependent upon its longest lead time component. Moreover, the technical incentive of developing a new concept of an engine, for example, is as vitally needed as is the development of a specific engine for a particular airframe.

The impact of the weapon system concept on future procurement is considered further later in this chapter. The section that follows presents examples of the application of the concept to aircraft procurement by the Air Force and the Navy.

2. APPLICATIONS OF WEAPON SYSTEM PROCUREMENT

A major problem facing BuAer is the need to deal with the increased complexity of weapons and the need to provide complete and

timely integration of them. At the same time, it must eliminate any disadvantages of a weapon system approach to aircraft procurement.

The examples given in the following paragraphs indicate approaches that were taken to this problem by the Air Force and by the Navy in aircraft and missile programs. There is no brief held by either of the services or by contractors that these examples show the optimum approaches, that they are the only ones that might have been taken, or that they are pattern-setting for the future. They are, however, among the most significant recent instances of applications of the weapon system procurement concept.

(1) Convair Exercised Major Weapon System Responsibility for the Development of the B-58 (Hustler) Supersonic Bomber

The B-58 represents a large step forward in the state of the art with respect to bomber airframe, propulsion and electronics and controls. The general operational requirements called for a high altitude, long-range, supersonic bomber-reconnaissance weapon system of high performance capability. Development and delivery of production articles had to be accomplished in record time.

The subsystems and components under development or available at the time the B-58 program was initiated were designed

in a period when the B-58's performance could not have been anticipated. To incorporate them into the B-58 or to make them compatible with the total aircraft system would have required considerable modification or further development. This factor, plus the unusual requirements that were placed upon the packaging of components to assure their physical fit into the airframe, led the Air Force to assign to the prime contractor responsibility for (1) airframe design, (2) design and procurement of necessary electronic and control equipment, and (3) close technical surveillance of the propulsion system.

Except for engines and some "off-the-shelf" items, the weapon system contractor undertook to supply all necessary equipment.

Convair began its initial design studies in February 1951, to determine the configuration and integration of an entire bomber weapon system. The Air Force stipulated in its contract that the contractor was not to increase the scope of its manufacturing functions because of this work. Its management functions were to be increased, however, and Convair was to assume "the overall responsibility of the weapon system involved."

The chief results of the B-58 program as of the time of this study appear to be these:

1. The development program is on schedule. Production deliveries, however, are behind schedule.

2. Aircraft performance, to the extent that it is measurable so far in the program, meets or exceeds specifications.

3. By and large, vendor furnished items are on time.

4. The technical and functional objectives originally set for subsystems are being met in virtually all cases.

5. The time from program go-ahead to first flight of the aircraft was notably short, less than three years.

6. Costs to date have exceeded original estimates by a significant amount.

7. By delegation of significant responsibilities, the Air Force has admitted the contractor to a partnership arrangement which is generally satisfactory for operating purposes.

These are the chief results of the B-58 program as far as it has gone in the initial development stage. As the production phase is entered, a number of problems have arisen. These include such items as performance guarantee and production control problems. These problems are spelled out further in Appendix G.

For its part in the partnership arrangement, the Air Force exercises its over-all weapon system management responsibilities through its weapon system project office (WSPO).

The WSPO is the Air Force's central office for the management of an aircraft program. It is the channel that joins the contractor with the Air Force for program requirements, decisions, resources and support. This office is staffed with both technical and procurement personnel from ARDC and AMC, respectively. Their job is to work together as a team to assure the rapid progress of the B-58 development in line with Air Force objectives and requirements.

The WSPO is discussed further in Chapter V in relation to administration and control of procurement. Appendix G contains further details and discussion of the B-58 program.

(2) <u>The Air Force Is the Weapon System Manager for the ICBM Program</u>

The Ballistic Missiles Division of the Air Research and Development Command has direct supervision of 19 prime contractors and also deals with a larger number of associate and subcontractors. It has military responsibilities in such areas as missile installations, use and training. It receives procurement support from the Air Materiel Command, Ballistic Missiles Office, and has contracted with the Ramo-Wooldridge Corporation for its function as technical director and system engineer for the ICBM program.

Ramo-Wooldridge deals directly with prime missile contractors as the representative of the weapon system manager. As such, it is the so-called "third party" in the relationship. Its chief concerns are to (1) provide the basic design concept, (2) approve the detailed specifications developed by the prime contractors, and (3) specify the fundamental testing programs which will be applied to the missiles.

Ramo-Wooldridge was selected for the job because ICBM development was a crucial need and scientists of highest caliber were required to speed the program. The Air Force did not have available sufficient men of the required stature. Ramo-Wooldridge had the nucleus of such a force and could attract other scientists of high quality. Furthermore, this contractor was regarded by the Air Force as being competent, objective and noncompetitive with other missile contractors.

The Air Force appears to be generally satisfied with the success to date of this "third party" approach. Nevertheless, it is recognized that there are a number of practical problems to be dealt with. Some of these are:

1. The third party contractor receives a low financial return on purely engineering contracts in comparison with the return from the same number of man-hours invested in developing a production contract item.

2. The contractor must be allowed business growth opportunities and diversification into end-item production in order to preserve the initiative, experience and morale of his engineers, and to provide him with an adequate business incentive.

3. There are strong fears and objections on the part of prime contractors to the effect that the third party contractor may (1) exclude them from their rightful place in the research and development area, (2) take over control of their programs, or (3) place them at a competitive disadvantage by acquiring complete knowledge of their operations during the normal course of his duties.

Ramo-Wooldridge and some of the associated prime contractors have indicated that the third party approach is not desirable or effective as a procurement device other than for its possible use as a special tool in a grave national emergency.

(3) The P6M Program Represents an Advanced Use by BuAer of Weapon System Procurement of an Experimental Aircraft

BuAer has not adopted the weapon system concept as fully as the Air Force. Special considerations involving aircraft flight from carrier decks and other conditions unique to naval operations appear to make it necessary, in the Navy's view, for BuAer to retain detailed technical management control.

The advent of the P6M SeaMaster, however, gave BuAer the opportunity to reappraise its interest. The situation that encouraged this change was:

1. The P6M represented a significant advance in the state of the art regarding a high performance, jet powered, water based, mine laying seaplane.

2. The Martin Company was an experienced developer and producer of seaplanes.

3. There were sufficient indications, at the time the program was begun, to support the judgment that the weapon system approach could result in time and cost savings, and that centralized project management could contribute to turning out a better aircraft.

The P6M is discussed as a detailed case study in Appendix A. It is also discussed further in other sections of this report. It is of interest to note here, however, that the prime criterion of this weapon system approach was that Martin undertook to procure and supply subsystems that might otherwise have been supplied as GFE. These items include J-71 Allison engines, radar equipment, mine navigation system, auxiliary power plant and auto pilot.

The Martin Company feels that the weapon system approach has resulted in improved integration of design and has facilitated the completion of the experimental aircraft. This view is not widely shared by all BuAer personnel; many feel that the possible advantages of weapon system procurement are overshadowed by the high cost of the program and late delivery of the preproduction aircraft.

Loss of the two experimental P6M aircraft and the consequent need for BuAer to retain even closer program supervision makes an accurate over-all appraisal of the weapon system features of the P6M program impossible. Additional study of the application of the weapon system approach to other naval aircraft is needed in order to appraise its benefits and limitations more conclusively. Particular attention should be given in such a study to these points which the P6M case study showed to be important weaknesses:

1. Confusion and indecision resulted from a lack of clear definition of the respective responsibilities and authority of BuAer and the contractor.

2. The weapon system contractor's supervision of subcontractor cost estimating and performance was not completely adequate.

3. Criteria for determining a suitable weapon system management fee are inadequate, controversial or nonexistent.

4. The contractor required the assistance of the Navy to complete the procurement of CFE items.

The P6M study also indicated that many BuAer persons measure the weapon system responsibility of a contractor principally in terms of the amount of CFE supplied. This view, of course, neglects the important advantage of weapon system management at the contractor level--the advantage of central system coordination and integration.

(4) BuAer Is the Weapon System Manager for the Sparrow III Missile System

Raytheon Manufacturing Company was desig ıated by BuAer as its "prıncipal development contractor" for the Sparrow III missile. As such, Raytheon has contracted to ıntegrate both GFE and CFE elements of the mıssile system into a satısfactory configuration.

Raytheon does not, however, have coordinating authorıty for the various subsystems (e. g., radar, controls, safety and arming devıce and others) whıch it must integrate ınto the mıssile. The suppliers of these ıtems have their own direct contractual relationships with the Bureau or wıth theır own prime contractors.

Recognizing that coordination of desıgn ıs essentıal to a successful weapon system, Raytheon has been encouraged by BuAer to contract separately with subsystem suppliers to insure operatıng compatıbility among system components. This not only increases the over-all cost of the program, ıt also subjects subcontractors to direction at the same time from at least two "bosses." One is Raytheon. The other may be either an associated prime contractor other than Raytheon, or the Bureau of Aeronautics and ıts several divısions that are concerned in the program.

BuAer's Guided Missiles Division supplies weapon system management through its assigned project officer. To some extent, however, this Division shares responsibility with the Avionics Division. In effect, therefore, there is no single weapon system management responsibility or control at either the BuAer or the contractor level.

Further details and discussion of the Sparrow III are presented as a case study in Appendix D.

These four examples of application of the weapon system concept help to point up the need for continued study of the idea as a procurement device. The need is to develop sound guiding principles that will assure greater effectiveness of aircraft weapon system procurement. That there will be increasing use of the concept in the future is borne out by the discussion in the following section.

3. IMPACT OF THE WEAPON SYSTEM CONCEPT ON FUTURE PROCUREMENT

The impact of weapon system procurement is not likely to cause a revolutionary, or even a major, change in the character of the contracting function. It will require rather that the present process be even better implemented. It will require a higher caliber of performance on the part of both BuAer and weapon system contractors, and could cause

a change in the Bureau's present organizational concept. These influences are discussed in detail in Chapter V.

To the extent that significant items of impact on the contracting function have been determinable, they are discussed in the paragraphs that follow.

(1) The Weapon System Approach Is Likely To Be Widely Used for Procurement of Experimental Aircraft

Military and industry leaders generally agree that the rapid technological advance that has characterized the past two decades will continue and increase into the future. Modern warfare requirements will be even more dependent upon technical ingenuity and on production responsiveness for the timely supply of new, complex weapons. The weapon system concept will find greater use as a device to shorten the development time cycle, and thus the procurement cycle.

Present experience gives some evidence that the weapon system approach is likely to turn out a better weapon sooner. It may be particularly useful where a complex system and a large advance in the state of the art are involved.

There is no factual basis yet available to prove that the weapon system approach is any more or less costly than the nonweapon system approach.

(2) Weapon System Procurement Requires More Effective Cost Controls

Careful cost estimating of the system as a whole, and of each subsystem, is a basic requirement. Inasmuch as the cost estimate reflects the total program cost, a serious underestimate could affect the completion of the development if allocated funds are used up too quickly.

Cost control within the allocated program budget receives more emphasis under weapon system management. Each segment of the system must be carefully managed to attain the technical objective within the assigned money limit.

(3) Cost Incentives Are Likely To Be Most Effective in Weapon System Procurements

Because of the developmental nature of weapon system procurements, cost-type contracts are likely to find major application.

Proper control over the large amounts of money involved and the amount of subcontracting to be done will dictate that the

most effective contract incentive is one based on program costs. An incentive fee that rewards more successful control over costs, should encourage more satisfactory contractor performance.

(4) Program Monitorship Rather Than Detailed Supervision Will Be Required of BuAer under the Weapon System Concept

The proper role for BuAer under the weapon system concept is to provide management of the over-all aspects of an aircraft program. In this position it should plan and schedule each phase of the program and monitor program results. It should keep continuous measure of these results against planned objectives.

The Bureau should not become enmeshed in program details to the extent that it is prevented from exercising effectively its program review authority.

(5) Weapon System Procurement Requires Higher Caliber Technical and Administrative Personnel in BuAer and BAR Offices

The present BuAer system of control over contractor operation requires that Division and BAR personnel check into details of operation.

Under the weapon system concept, these details would become the responsibility of the weapon system contractor. The

BuAer and BAR role would be to provide general supervision and program review.

It is doubtful that BuAer would require less personnel than it now has to operate under the weapon system concept. There is no doubt, however, that under the weapon system concept people of higher skill and business acumen would be needed in order to review contractor procedures and operations.

(6) Sound Performance Criteria Are Required as a Basis for Determining Proper Weapon System Contractor Fee

A major impact of the weapon system concept is the need to develop a proper fee structure for a contractor's weapon system management function. At present, a reduced fixed fee is applied to subcontracted items. A fixed sum based on engineering hours may be applied to initial system integration studies.

A satisfactory structure has yet to be established which properly recognizes the elements of risk, performance, contribution and recompense for management services. Careful study will be required to develop the criteria for fee determination.

The recommendations in the following section are presented with a view toward adapting the contracting function to the future impact of weapon system management and procurement.

RECOMMENDATIONS

THE WEAPON SYSTEM CONCEPT

The following recommendations are made with a view toward strengthening the procurement process for the future, and adapting the weapon system approach to aircraft procurement within the present pattern of the contracting function. They cover, essentially, application of the weapon system concept. Recommendations covering implementation of contracting and contract administration practices in the light of weapon system application are covered in the chapters that follow.

1. APPLY THE WEAPON SYSTEM APPROACH PRIMARILY TO THE PROCUREMENT OF EXPERIMENTAL AIRCRAFT

The Chief, BuAer should formalize the trend in the Navy to give contractors increased participation in procurement programs through use of weapon system procurement.

The weapon system concept, as defined in this chapter, should be applied primarily to the research and development phases of procurement where it is likely to be most effective.

Until application problems in the production, supply and maintenance phases, which were previously discussed, are worked out through

further study, the concept should not be extended to production aircraft in any major degree. Rather than applying the weapon system concept to production aircraft, GFE should be continued to be supplied as a general rule. Presently available procurement procedures should be employed for the stages beyond production until more effective methods are developed.

2. IDENTIFY THE SPECIFIC RESPONSIBILITIES AND AUTHORITY OF THE WEAPON SYSTEM CONTRACTOR

In each case where the weapon system approach is used in an aircraft development program, the Director, Contracts Division should assure that the contractor's responsibility and authority are clearly spelled out in the contract. The contractor should also have a clear understanding of the relative position and duties of the BuAer weapon system manager.

The weapon system contractor should be assigned responsibility and authority for conceptual design of the weapon system, and for the specification of its subsystems and components. He should also be held responsible for coordinating and integrating the total system, and for demonstrating that it performs according to requirements. The performance guarantees, discussed in Chapter III, should be enforced to the extent they apply to a development program.

BuAer should assign responsibility and authority to the contractor to deal directly with subcontractors on subsystem and component procurements, except where BuAer experience shows that procurement by the government has definite advantages, as in engine buying, quantity purchasing or in cases where special measures are needed to assure subcontractor cooperation.

3. EXPAND AND ENFORCE THE BU AER ROLE OF PROGRAM MONITOR AND REVIEW AUTHORITY

The weapon system concept does not alter the Navy's ultimate responsibility for any aircraft program undertaken. It should be clear that in establishing a weapon system contractor, the Navy is delegating certain specific operating responsibilities and authority. It retains responsibility and authority to monitor, review and approve all basic program actions.

BuAer has a prime need to assure itself that the contractor will not incur serious technical errors. The Chief, BuAer should take steps to provide this assurance by making certain that the following practices are observed.

(1) Assure at the outset of an aircraft development program that the contractor comprehends the intended mission, operational environment, combat doctrine, design criteria and desired military characteristics.

(2) Keep the contractor informed of pertinent plans, policies, decisions and other matters that bear on program success. Establish effective partnership communications.

(3) Review and approve conceptual design and general design and layout drawings.

(4) Review and approve design specifications, performance criteria, testing objectives and procedures.

(5) Maintain continual personal contact through plant visits, periodic reporting, status analysis against established benchmarks, program review conferences, and implement the types of contractor controls that are indicated as necessary in Chapter V.

(6) Maintain surveillance over general design and major technical decisions through local BAR personnel.

In general, BuAer's attitude should be centered on the over-all success of the program and not on concern with operating details.

4. BU AER SHOULD REVIEW AND APPROVE ONLY MAJOR SUBCONTRACTS GENERATED BY WEAPON SYSTEM CONTRACTORS

Present government policies relating to subcontracting appear to be generally applicable to weapon system procurement. They should

be enforced by BuAer to the extent current conditions encountered make it possible or desirable to do so.

In some cases, as in guided missile production, enforced subcontracting may result in a more costly, less reliable product. In other cases, where the prime contractor's workload has been decreased, enforced subcontracting may constitute an economic hardship.

On the other hand, the weapon system contractor should be encouraged to subcontract where possible. Generally, he should not be permitted to establish new facilities or a new business activity that might tend to reduce competition or small business opportunities, or might unduly concentrate mobilization production resources.

As in other areas of procurement, sound business judgment must apply to subcontracting review. The handbook approach of rigid rules universally applied is not realistic. As a general guide, contractors should make those things for which they have proper facilities, capacity and experience. The criterion should be the prime contractor's ability to make the desired item in quantity, and at quality and cost levels better than could be obtained through outside buying. Contractors should subcontract for those things where there is a significant quality, delivery or cost advantage to do so.

The present practice of BuAer's review of major subcontracts should be continued, but on a much higher level. The Chief, BuAer should resist any effort by the Office of Naval Material or any other agency to increase the Bureau's workload of operating details. This view may require a revision of the ASPR requirement that would have BuAer make a detailed analysis and justification of most, if not all, prime contractor subcontract actions.

Under weapon system procurement this detail is extraneous to BuAer's role of monitorhsip. The Chief, BuAer should be assured through inspections at the contractors' plants that each contractor has a proper subcontracting procedure. Spot checks should be made by the BAR to make sure that the approved procedure is being followed meticulously. The operating details under each subcontracting system should be made the responsibility of the weapon system contractor. The BAR should discontinue the present detailed review of routine purchase orders.

The subcontracts that BuAer should approve prior to their award by the weapon system contractor are major ones that involve critically important items, or those that represent a major portion of the program effort. As an approximation, only subcontracts in excess of say, $500,000 should be reviewed and approved by the cognizant BuAer program team. This review should cover the subcontract price, terms, scope, methods

of having arrived at the subcontract and the selection and qualification of the subcontractor. The propriety of these items with respect to government policies should be considered in making the approval.

In order to assure that this review does not impede program progress, a time limit for rejection by BuAer, of a proposed subcontract, should be established. Unless rejected within, say, 10 days, a proposed subcontract would be automatically approved unless BuAer issued an intervening hold order which would also carry a time deadline.

5. ESTABLISH A PROPER FEE STRUCTURE FOR PERFORMANCE BY WEAPON SYSTEM CONTRACTORS

Present pricing practice is to assign a lower fee rate to cover those items of a system that are purchased from a subsystem contractor as compared with the fee paid for items fabricated by the prime contractor. This practice does not recognize adequately the contribution of the weapon system contractor.

A fee structure is required that properly recognizes the contribution and performance of the weapon system contractor. This management fee should be treated as distinctly different from profit on normal in-plant operations and should be determined on the basis of sound and measurable performance and similar criteria.

Factors that should be considered by the Chief of Naval Material and the Director, Contracts Division in determining an appropriate fee for weapon system contractors include:

(1) The weapon system contractor's contribution to the basic design of the weapon system and identification and specification of all its parts.

(2) The weapon system contractor's performance in locating competent subcontractors and in concluding satisfactory contracts with them.

(3) The over-all risk assumed by the weapon system contractor, including the performance and work results of the subcontractors.

At the present time, these matters are items of argument and disagreement between BuAer negotiat rs and contractors. The establishment by the Chief of Naval Material of guiding policy based on further study is needed.

The net effect of these recommendations is to place a greater amount of responsibility and authority for program details into the hands of the aircraft contractor. The checks and balances that permit control and monitorship of this role of the weapon system contractor, to the extent it is properly formulated and administered, are contained in the aircraft contract. The aircraft contract is discussed in detail in the next chapter.

III. THE AIRCRAFT CONTRACT

III. THE AIRCRAFT CONTRACT

The framework of the aircraft contracting function is formed by the characteristics of the industry, by regulations, policies and practices of the Department of Defense and the Department of the Navy, and by a multitude of political, economic and military considerations. As previously indicated, many of these factors are outside the scope of the Bureau of Aeronautics; most of them are outside the scope of the Contracts Division. Yet it is upon the contracting officer in the Contracts Division that these forces reach their vertex. It is he who must weld these forces into a coherent, enforceable contractual instrument.

The purpose of this chapter is to describe the aircraft contract document and the factors affecting it. For background, the chapter reviews first the function of contracting and the role of the Contracts Division. More detailed analyses of contract type, price and incentive and other contract terms follow. The interrelationship of contract type, price and incentive are particularly noted. Present Bureau contracting practices are reviewed and appraised in the light of the current procurement environment as well as in the light of probable future trends in weapon system procurement.

Specific recommendations for action are summarized at the end of the chapter.

1. THE CONTRACTING FUNCTION AND THE CONTRACTS DIVISION

It is important at the outset to distinguish between the contracting function and the total procurement effort which eventually leads to delivery of aircraft to the fleet. Further, it is important to note the role played by the Contracts Division in both the total procurement cycle and in the contracting function.

(1) The Contracting Process Is the Culmination of Many Prior Decisions Affecting the Procurement of the Purchased Article

With the exception of price, type of contract, and other specific contract provisions, virtually all other procurement arrangements have been made prior to the time of contract negotiation. As noted in Chapter I, these include, selection of contractor, establishment of quantity and delivery schedules, availability of funds and facilities for production, and determination of specifications.

The normal processing cycle for aircraft contracts is shown in Exhibit III, following this page. The cycle begins with the preparation of the procurement request and is completed

STEP	Originator (Prod., Main. or Other Divisions)	Technical Division of R&D Group	Security Control Officer	Contracts Division	Small Business Specialist	Office Services Division	Procurement Review Board	Indus Plan Divi
Proposal Request								
1. Prepares Procurement Request (P. R.)	X							
2. Coordinates if P. R. Requires Material under Its Cognizance		X						
3. Approves Security Requirement Check List			X					
4. Drafts and Mails Request for Proposals				X				
5. Duplicates Drafts						X		
6. Receives Request for Proposal and Prepares Bid								
Proposal Review and Clearance								
7. Reviews Bid and Arranges Procurement Review Board Meeting, if Required				X				
8. Reviews Proposal Against Procurement Requirements	X							
9. Reviews Proposal for Compliance with Specifications, as Necessary		X						
10. Reviews Proposal and Recommends Award, if Required							X	
11. Establishes and Records Necessary Routings on Document Route Sheet				X				
12. Reviews for Small Business Requirements					X			
13. Certifies with Respect to Production Allocation Program and Industrial Facilities								X
14. Assigns Contract or Amendment Number				X				
15. Commits Funds and Certifies that Funds Are Available								
16. Reviews Contract Security Reports, as Necessary			X					
17. Approves P. R. 's for $10,000 and over for Material under Its Cognizance								
18. Reviews all Procurements Requiring Deputy and Ass't. Chief's Approval								
19. Approves P. R. 's for $300,000 and over								
Negotiation								
20. Negotiates Price, Terms and Type of Contract				X				
21. Advises Negotiator Re Technical Aspects of Pricing, as Required	X	X						
22. Prepares Determination and Finding Re Method of Contracting				X				
23. Prepares Business Clearance for ONM Approval				X				
24. Reviews and Approves Determination and Finding								
25. Reviews and Approves Business Clearance								
Contract Drafting								
26. Drafts Contractual Document				X				

EXHIBIT I

Bureau of Ae
Department o

PARTICIPATION I
CONTRACTI

	BUREAU OF AERONAUTICS													OFFICE C NAVAL MATERIA
acts ion	Small Business Specialist	Office Services Division	Procurement Review Board	Industrial Planning Division	Comptroller Division	Ass't. Chief for Research and Development	Ass't. Chief for Procurement	Ass't Chief for Field Activities	Ass't. Chief for Plans and Programs	Deputy and Ass't. Chief of Bureau	Counsel	Quality Control Division	Patent Counsel	
		X												
			X											
	X													
				X										
					X									
						X	X	X						
									X					
										X				
														X
														X

2

EXHIBIT III (1)

Bureau of Aeronautics
Department of the Navy

PARTICIPATION IN THE AIRCRAFT CONTRACTING PROCESS

BUREAU OF AERONAUTICS										OFFICE OF NAVAL MATERIAL	CONTRACTOR
Industrial Planning Division	Comptroller Division	Ass't. Chief for Research and Development	Ass't. Chief for Procurement	Ass't Chief for Field Activities	Ass't. Chief for Plans and Programs	Deputy and Ass't. Chief of Bureau	Counsel	Quality Control Division	Patent Counsel		
											X
X											
	X										
		X	X	X							
					X						
						X					
											X
										X	
										X	

JAMESTOWN

STEP	Originator (Prod., Main. or Other Divisions)	Technical Division of R&D Group	Security Control Officer	Contracts Division	Small Business Specialist	Office Services Division	Procurer Review
Contract Circulation.							
27. Routes Draft for Necessary Approvals				X			
28. Approves Wording and Legality of Proposed Contract							
29. Approves Patent Clauses in Proposed Contract							
30. Redrafts when Necessary				X			
31. Approves Additional Funds when Necessary							
32. Assigns Cognizant BAR or Inspector							
33. Negotiator Certifies Completeness of Proposed Contract				X			
34. Prepares Document for Duplicating				X			
35. Duplicates Contract						X	
36. Forwards Contract to Contractor for Signature				X			
Contract Signature							
37. Signs Contract or Returns for Revision							
38. Contracting Officer Signs Contract				X			
Contract Revision							
39. Reviews Revision and Makes Necessary Changes	X	X		X			
40. Conducts Additional Negotiation when Necessary				X			
41. Reviews upon Request of Negotiator	X	X					
42. Resubmits to Contractor for Acceptance				X			
43. Signs Revised Contract							
44. Contracting Officer Signs Revised Contract				X			

BUREAU OF AERONAUTICS

nical sion of Group	Security Control Officer	Contracts Division	Small Business Specialist	Office Services Division	Procurement Review Board	Industrial Planning Division	Comptroller Division	Ass't. Chief for Research and Development	Ass't Chief for Procurement	Ass't-Chief for Field Activities	Ass't. Chief for Plans and Programs	Deputy and Ass't. Chief of Bureau	Counsel	Qua Con Div
		X												
													X	
		X												
							X							
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		X												
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	BUREAU OF AERONAUTICS										OFFICE OF NAVAL MATERIAL	CONTRACTOR
ment Board	Industrial Planning Division	Comptroller Division	Ass't. Chief for Research and Development	Ass't Chief for Procurement	Ass't.Chief for Field Activities	Ass't. Chief for Plans and Programs	Deputy and Ass't. Chief of Bureau	Counsel	Quality Control Division	Patent Counsel		
								X				
										X		
									X			
												X
								X		X		
												X

upon the signing of the contract. Only the normal sequence of procurement action is illustrated in the exhibit. Unusual program problems involving funding, quantity or delivery can cause the retracing of steps and extra reviews. In addition to the review at the division level indicated in Exhibit III, there are extensive reviews at branch, section and unit levels.

All of the foregoing review and approval actions combine to mold the content of the final contract document. In consideration of these many prior decisions, it is apparent that the contracting function is the responsibility of numerous divisions and offices of the Department of the Navy and not merely that of the Contracts Division.

(2) The Contract Document Establishes and Codifies the BuAer-Contractor Relationship

The contract document seeks to define and formalize a series of procurement agreements under which the contractor will supply aircraft to the Navy. It spells out the basis upon which the two parties will do business with one another. Specifically the contract covers:

1. Articles to be procured and their specifications
2. Cost and pricing arrangements

3. Delivery schedule

4. Performance of the article and performance guarantees and related provisions

5. Availability of facilities

In addition to these provisions, the contract contains a large number of definitive limits under which business is conducted with the government in general and with the Navy in particular. Thus, the contract becomes an omnibus covering many laws, policies and government regulations, as well as the specific arrangements for the particular procurement action.

(3) Principal Functions of the Contracts Division Are Negotiation of Price and Documentation of the Contract

The procurement request, which describes the aircraft to be bought, is the basis for contracting action by the Contracts Division. Upon receipt of this request, the Contracts Division requests cost estimates from the designated aircraft manufacturer. Following receipt and analysis of these estimates, actual negotiation takes place and the contract is eventually documented. The principal results of negotiation are.

1. Agreement on price

2. Selection of type of contract

3. Agreement on special contract clauses

By the time contract negotiations begin, the Bureau of Aeronautics has already been committed by prior steps and decisions to buy a designated quantity and type of aircraft from a designated manufacturer. This action usually includes buying supporting spares and related equipment and services as well. Thus, the Contracts Division provides an important service to the procurement process. It does not play an exclusive or commanding role in the process.

(4) Procurement by Negotiation Rather Than by Advertising Is Most Appropriate for Aircraft Buying

Purchasing by means of negotiated contracts, rather than by advertising for sealed bids, is the most practical method for aircraft procurement.

The negotiation process properly takes into account the various influences affecting source selection, the complex and variable nature of aircraft operational requirements as well as of design, development and production factors, and the specialized technical and financial resources required to complete an aircraft program successfully. The advertising method gives no consideration to these factors and is inherently unsuitable for aircraft buying.

For these reasons, the balance of this chapter is devoted to discussion of the types of negotiated contracts authorized by ASPR for aircraft procurement.

2. CONTRACT TYPES

A variety of contract types are available for use generally in the purchase of goods and services. The Armed Services Procurement Regulation reduces this variety for military procurement purposes to a relatively few uniform types. This section reviews these types and analyses their applicability to specific situations.

(1) Four Basic Types of Contracts Are Used by BuAer for Aircraft Procurement

Basic authority for the type of contract to be used in procurement by negotiation is contained in Section 3, Part 4 of the Armed Services Procurement Regulation. This regulation describes and defines approved types of contracts and the general areas of their applicability. It also imposes conditions on the use of certain types of contracts. These conditions are discussed later in this section.

The following contract types are authorized by ASPR and are used by BuAer for aircraft procurement.

Type of Contract	Authorization ASPR Section
Firm fixed-price (FFP)	3-403.1
Fixed-price incentive (FPI)	3-403.4
Cost-plus-fixed-fee (CPFF)	3-404.3
Letter contract (or letter of intent)	3-405.3

Within and between these basic types, there are numerous possible variations. The fixed-price incentive type offers perhaps the greatest opportunity for different pricing arrangements to meet varying procurement situations.

These four basic types of contracts are likewise used by the Air Materiel Command (AMC) for aircraft procurement for the Air Force. In addition, AMC uses the cost-plus-incentive-fee (CPIF) type of contract authorized by ASPR Section 3-404.4. Under this contract, the contractor is reimbursed for all allowable cost. His fee is adjusted by formula on the basis of the relationship of total allowable cost to target cost. In order to provide an extra incentive to contractors in excess of the rate (7%) which could be earned on a cost-plus-fixed-fee contract, AMC has obtained approval from the Secretary of the Air Force for maximum fees up to 9% on CPIF contracts.

AMC has also made limited use of a successive formula type of fixed-price incentive contract. This is a deviation from ASPR and requires approval of the Secretary of the Air Force. Under this method, an initial formula is established which remains in effect until cost experience permits negotiation of a final formula. Target profit initially set is not changed in the final formula. This type of contract is essentially CPIF in the initial period and FPI in the second.

A summary description of each type of contract used by BuAer and AMC for aircraft procurement and its applicability, advantages and disadvantages is given in Exhibit IV, following this page.

(2) Virtually All Recent Aircraft Production Contracts Have Originated in Letter Contract Form

Over 90% of all aircraft production contracts written by BuAer since 1951 have been initiated through the use of letter contracts.

The wide use of letter contracts early in an aircraft program to provide contractual authorization has been the result of (1) lack of firm specifications regarding the aircraft to be manufactured; (2) lack of adequate cost data upon which to base

CONTRACT TYPE	DESCRIPTION	APPLICABILITY	ADVANTAGES
1. Firm Fixed Price	Firm price, including profit, established at outset. Price not subject to adjustment by contracting officer by reason of contractor's cost experience. Actual profit is dependent upon contractor's ability to control costs within the contract scope.	Applicable only if firm specifications have been established and contractor has sufficient production experience on which to base a valid price. As a practical matter, these situations are rare in aircraft procurement under present program conditions.	Places maximum risk and resp bility on the contractor, and t provides maximum incentive trol of cost by contractor. Permits closer estimating of a program costs.
2. Fixed-Price Incentive	Share ratio, firm target cost, target profit and price ceiling and final profit negotiated at outset or at an early date in the contract period. Government and contractor share savings or losses on basis of negotiated share ratio. If total costs are less than target costs, contractor makes target profit plus his share of savings up to the established ceiling on final profit. If total costs exceed target costs, contractor makes target profit less his share of excess costs. Government and contractor share costs up to an established cost ceiling; contractor pays all costs over cost ceiling. Establishment of target profit or share ratio prohibited until firm target cost is negotiated.	Feasible plan for sharing of long-run production costs, but not generally applicable for research and development or initial production because of absence of production experience upon which to base reasonable target costs.	Provides an effective pricing c promise in situations where ac cost experience is limited but ably predictable. Provides more incentive for co savings than a cost-type contra (CPFF or CPIF). Provides less incentive for cost than a firm fixed price, but ha greater likelihood of acceptanc both the Navy and the contract to uncertain production conditi surrounding the majority of air procurements. Pricing formula can be varied most procurement situations in any reasonable degree of valid duction experience. This grea flexibility in negotiation is mo likely to result in a price whic equitable to both the contracto the Navy.

EXHIBIT IV (1)

Bureau of Aeronautics
Department of the Navy

APPLICABILITY, ADVANTAGES AND
DISADVANTAGES OF CONTRACT TYPES

CRIPTION	APPLICABILITY	ADVANTAGES	LIMITATIONS OR DISADVANTAGES
including profit, at outset.	Applicable only if firm specifications have been established and contractor has sufficient production experience on which to base a valid price. As a practical matter, these situations are rare in aircraft procurement under present program conditions.	Places maximum risk and responsibility on the contractor, and therefore provides maximum incentive for control of cost by contractor. Permits closer estimating of actual program costs.	Price negotiated may include unreasonable contingencies resulting in excessive profits to contractors. Review of contractor's actual profits by Renegotiation Board and potential review by Congressional committees make both parties reluctant to use this type of contract. Contractors consider that the financial risk is not worth the limited opportunities for retention of profits. Consequently, the incentive features inherent in this type of contract are negated.
bject to adjustment ng officer by reason r's cost experience.			
t is dependent upon ability to control the contract scope.			
firm target cost, and price ceiling ofit negotiated at an early date in the iod.	Feasible plan for sharing of long-run production costs, but not generally applicable for research and development or initial production because of absence of production experience upon which to base reasonable target costs.	Provides an effective pricing compromise in situations where actual cost experience is limited but reasonably predictable. Provides more incentive for cost savings than a cost-type contract (CPFF or CPIF). Provides less incentive for cost savings than a firm fixed price, but has greater likelihood of acceptance by both the Navy and the contractor due to uncertain production conditions surrounding the majority of aircraft procurements. Pricing formula can be varied to meet most procurement situations involving any reasonable degree of valid production experience. This greater flexibility in negotiation is more likely to result in a price which is equitable to both the contractor and the Navy.	Establishment of target cost may be delayed beyond the point where incentive feature can be effective. Requires reasonably reliable cost estimates obtainable only by establishment of reasonably firm specifications and some production experience. Degree of incentive varies in proportion to share ratio; a low share ratio provides only slightly greater incentive than a CPFF or a CPIF contract. A high share ratio, while providing considerable incentive opportunities, may be impractical for the reasons stated above regarding the firm fixed-price type of contract. Target cost may include unreasonable price contingencies so that the contractor can readily meet the target cost. Separate negotiations for initial and final targeting and redetermination of costs add to negotiator's workload. Contractor's accounting system must provide adequate basis for segregation of costs by contract to permit price redetermination.
and contractor s or losses on basis d share ratio. If re less than target actor makes target is share of savings tablished ceiling on If total costs exceed , contractor makes it less his share of . Government and hare costs up to an cost ceiling; con- all costs over cost			
nt of target profit lo prohibited until cost is negotiated.			

CONTRACT TYPE	DESCRIPTION	APPLICABILITY	ADVANTAGES
2. Fixed-Price Incentive (Cont'd)	Under the successive formula method used by AMC, an initial formula is established which remains in effect until cost experience permits negotiation of a final formula. Target cost, share ratio and minimum and maximum profit rate are renegotiated; target profit is not changed. Essentially, this contract is CPIF in the initial period and FPI after renegotiation of the pricing formula.		Actual cost information is va for use in negotiating subseq production contracts, if rece promptly. In actual practice ever, final redeterminations been delayed so long as to b little use in negotiation of fo on contracts for that particul Cost ceiling provides limitat total program costs.
3. Cost-Plus-Incentive Fee	Government agrees to reimburse contractor for all allowable costs of performing work specified. Target cost, target fee, minimum and maximum fee and fee-adjustment formula negotiated at outset. Fee is adjusted by formula based on relationship of total allowable cost to target cost. When total allowable costs are less than target cost, contractor receives target fee plus increase up to maximum fee negotiated. When total allowable costs are more than target cost, contractor receives less than target fee, but not less than minimum fee negotiated. Incentive fee ceiling is identical to that allowed by ASPR for CPFF contracts, i.e., 7% on production and 10% on research and development.	Development. Tooling, manufacture and test of static article and first flight articles. Initial production.	Provides greater incentive th contract in situations where jections are not subject to re certainty due to complexity tion of the work. Contractor is motivated to b cost conscious because of risl diminishing profit rate.

CRIPTION	APPLICABILITY	ADVANTAGES	LIMITATIONS OR DISADVANTAGES
uccessive formula d by AMC, an initial established which effect until cost ex- ermits negotiation of nula. Target cost, and minimum and profit rate are re- ; target profit is not Essentially, this con- IF in the initial period er renegotiation of the mula.		Actual cost information is valuable for use in negotiating subsequent production contracts, if received promptly. In actual practice, however, final redeterminations have been delayed so long as to be of little use in negotiation of follow-on contracts for that particular model. Cost ceiling provides limitation on total program costs.	Definitions of allowed costs are not established. Section 15 of ASPR, which applies specifically only to CPFF contracts, is incorrectly applied to this FPI type of contract. The advantage of a target underrun is lost by the tendency of both BuAer and the contractor to buy additional changes with the money that becomes available.
t agrees to reimburse for all allowable costs ing work specified. t, target fee, minimum num fee and fee-adjust- ula negotiated at outset. sted by formula based ship of total allowable get cost. l allowable costs are less t cost, contractor re- get fee plus increase up im fee negotiated. l allowable costs are target cost, contractor ss than target fee, but an minimum fee . fee ceiling is identical owed by ASPR for CPFF i.e., 7% on production n research and develop-	Development. Tooling, manufacture and test of static article and first flight articles. Initial production.	Provides greater incentive than CPFF contract in situations where cost projections are not subject to reasonable certainty due to complexity or duration of the work. Contractor is motivated to be more cost conscious because of risk of diminishing profit rate.	Not suitable when no reasonable estimate of costs can be made, or where the need for advancement in the state of the art is so great that strong incentives to reduce costs are not desirable. Contractor's accounting system must permit identification of costs by individual contract. If maximum possible profit rate to be earned is the same as that provided on CPFF contract, contractor would be reluctant to accept the possibility of earning a lower profit by use of CPIF. Subject to the same cost overruns as CPFF contracts except that some control is achieved through incentive fee provisions.

	CONTRACT TYPE	DESCRIPTION	APPLICABILITY	ADVANTAGES
4.	Cost-Plus-Fixed Fee	Government agrees to reimburse contractor for all allowable costs of performing work specified. Fee negotiated at outset as a percentage of original estimated cost. Fee remains fixed regardless of cost experience in performance of original contract scope. Fee for additional work negotiated separately. Fixed fee on production contracts limited to 7% and on research and development contracts to 10% by ASPR. Actual negotiated rates are usually less than ASPR limits.	Research studies and investigations. Preliminary design. Wind tunnel tests. Mock-up. Initial tooling and production. Other special situations affecting production.	Provides contractual authority wh reasonably accurate costs cannot estimated due to lack of firm spe cations or lack of production exp ence. Government pays only for allowa costs as defined in ASPR, not for contingencies that do not occur.
5.	Letter Contract	Preliminary contractual instrument which authorizes immediate procurement of materials and services. Reimbursement of allowed costs, on a progress payment basis, is provided up to a maximum amount of government liability. No fee or profit earned by the contractor. Early conversion to a definitive contract is in the best interests of BuAer in order to control costs, and of the contractor in order to earn a fee or profit by a more definitive contract.	Applicable in emergency procurements when end-product delivery time is of the essence, or when the work is of a broad, undefined scope and not susceptible to any reasonable cost estimate which would permit issuance of a definitive contract.	Provides authorization to contract to begin work prior to signing of complete contract. Permits collection of actual costs provides opportunity for refined estimates prior to contract definitization.

EXHIBIT IV (3)

RIPTION	APPLICABILITY	ADVANTAGES	LIMITATIONS OR DISADVANTAGES
agrees to reimburse r all allowable costs ; work specified. ed at outset as a per- riginal estimated cost. fixed regardless of ice in performance of ract scope. ional work negotiated production contracts b and on research and contracts to 10% by al negotiated rates ess than ASPR limits.	Research studies and investigations. Preliminary design. Wind tunnel tests. Mock-up. Initial tooling and production. Other special situations affecting production.	Provides contractual authority when reasonably accurate costs cannot be estimated due to lack of firm specifications or lack of production experience. Government pays only for allowable costs as defined in ASPR, not for contingencies that do not occur.	Provides a minimum of incentive for the contractor to hold down costs and is not practical for use on large production runs. Contractor's accounting system must permit identification of costs by individual contract. Government is committed to reimburse contractor for all allowable costs. To the extent that the original cost estimate is understated because of: (1) lack of knowledge of future labor, material and overhead charges, (2) lack of adequate cost control, or (3) purposeful underestimating to obtain subsequent production contracts, there may be substantial overruns which will imperil program budgets. From the standpoint of the contractor to the extent that actual costs exceed estimated costs, actual profit rate is decreased proportionately. The combination of a high overrun and high disallowance may yield low profits or even a net loss to the contractor. The possibility of this loss does provide some incentive to the contractor.
contractual instrument izes immediate pro- materials and services. ent of allowed costs, payment basis, is to a maximum amount nt liability. No fee or by the contractor. sion to a definitive n the best interests of er to control costs, and ictor in order to earn a by a more definitive	Applicable in emergency procurements when end-product delivery time is of the essence, or when the work is of a broad, undefined scope and not susceptible to any reasonable cost estimate which would permit issuance of a definitive contract.	Provides authorization to contractor to begin work prior to signing of complete contract. Permits collection of actual costs; provides opportunity for refined estimates prior to contract definitization.	Conversion to a definitive contract is required by ASPR before 180 days elapse, or 40% of cost is incurred, whichever occurs first. Although this limitation may be satisfactory for general military procurement, it does not recognize aircraft long lead-time requirements (which may be 12-18 months). Provides no incentive to contractor to control costs. This may result in higher starting costs and thereby weaken the pricing position of BuAer at the time of conversion to a definitive contract. As currently prepared in BuAer, the letter contract is essentially a complete contractual document except for insertion of pricing and guarantee provisions. Therefore, the time required to process a letter contract is not appreciably less than that required for a definitive contract. Government assumes responsibility for payment of all allowable costs incurred. Hence, BuAer has no effective control over incurrence of costs by the contractor.

a target cost or fixed price; or (3) pressures placed on the Bureau to issue a "go-ahead" to the contractor for procurement of long lead time items in accordance with established requirements for fleet delivery.

Specific examples of the initial use of letter contracts in aircraft programs and the appropriateness of the action are noted in the case studies in the appendix volume of this report. In general, the use of letter contracts has been necessary and appropriate. In some cases, long periods of time have elapsed before these letter contracts were converted to definitive types. For example, approximately 34 months were required to convert contract NOas 55-170 in the F8U program. Delays such as this are due largely to the slow build-up of cost experience, inability of the Bureau and the contractor to reach prompt agreement on a target price, and to the time required on the part of both parties to reach agreement on certain contract clauses, and to sign the contract once the target price was established.

(3) Frequent Use of Fixed-Price Incentive Contracts Reflects a Compromise Sharing of Future Cost Variances and a Pricing Flexibility Inherent in This Contract Type

Exhibit V, following this page, summarizes the types of aircraft production contracts issued by BuAer during the fiscal

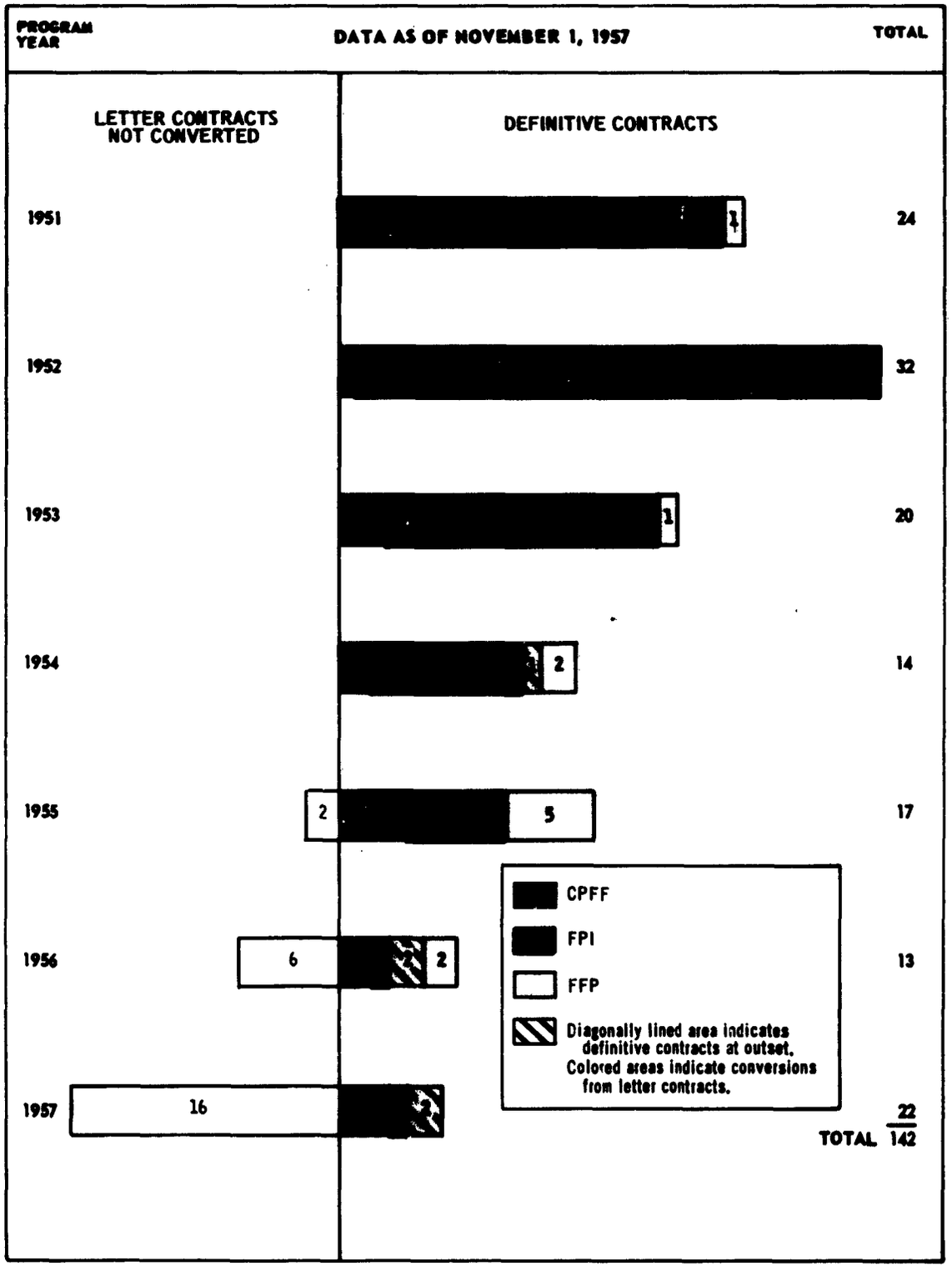
EXHIBIT V

BUREAU OF AERONAUTICS

DEPARTMENT OF THE NAVY

TYPES OF AIRCRAFT PRODUCTION CONTRACTS

Fiscal Years 1951-1957



years 1951-1957. This chart indicates the extensive use of fixed-price incentive contracts at the time of conversion from letter contracts. A total of 84 of the 106 definitive contracts from letter contracts were issued in this form.

The frequent use of fixed-price incentive type contracts upon conversion of letter contracts amounts to a compromise between BuAer and the contractor regarding the sharing of unknown or questionable production costs. Its use also reflects the wide adaptability and flexibility of this type of contract in a variety of procurement situations.

Target cost, target profit, cost ceiling and share ratio can be varied in many different combinations to satisfy both the contractor and the government. The flexibility provided by this type of contract gives both parties a substantial opportunity to arrive at a negotiated pricing arrangement which they consider equitable under the circumstances.

As the financing burden on the contractor increases, however, because of reductions in progress payments and stretch-outs of production, the contractor is less willing to take high incentive contracts. The trend toward low incentive and cost-type contracts probably will continue and may be accelerated as

financing in the industry becomes tighter and as the volume of business decreases.

(5) Late Targeting Reduces the Incentive Intended in the Use of Fixed-Price Incentive Contracts

The incentive features of the fixed-price incentive type of contract are created by the opportunity for the contractor to share in savings resulting from holding actual costs below target costs. The later in the production cycle the target is set, the more certain the contractor will be of meeting that target. There will have been no incentive provided, however, to aim at a lower cost target.

The contractor has maximum incentive under an FPI type of contract only when a firm target is established at the outset.

There are numerous instances of late targeting. In some of the case studies reported on in the appendix volume, the F9F-8 program for example, firm targets were set so far after the programs were started, it is doubtful that any appreciable incentive could have existed. More detailed data relative to late targeting on FPI contracts, in addition to the case studies, are shown later in this chapter in the section entitled "Contract Pricing."

The setting of FPI targets at an earlier date is not simply a matter of decision on the part of the Contracts Division. The ability and willingness of contractors to furnish adequate cost data upon which to base targets are critical factors. Also, the backlog of untargeted contracts created during the Korean emergency has impeded speedy targeting of new contracts.

It is believed, however, that from this date forward steps can and should be taken to get the full advantages of incentive contracts by earlier establishment of firm targets. Efforts now under way by the Contracts Division to effect closer control of conversion scheduling should assist the Bureau in achieving this objective.

(5) Use of Firm Fixed-Price Contracts for Aircraft Production Has Been Limited

While it is the intent of ASPR that firm fixed-price contracts shall be used to the maximum extent, in actual practice the appropriateness of this type of contract for aircraft production is extremely limited. As noted in Exhibit V, which follows page 98, only 16 out of 142 aircraft production contracts have been issued as firm fixed-price types since 1951. These particular contracts involved relatively small dollar amounts, long production experience or aircraft types not subject to major change.

The unwillingness of the contractor to accept the financial risk inherent in a firm fixed-price contract, particularly under conditions of renegotiation and a tight money market, and the unwillingness of BuAer to provide contingencies which might possibly lead to excessive rates of profit for the contractor, have been principal limitations on the use of this type of contract. In addition, opportunities for long-run production experience on a given model have been rare. Consequently, the accumulation of sufficient cost experience upon which to base a valid firm fixed-price agreement has not been possible in most instances.

In summary, cost-type contracts do not permit effective control over program funds. They have been used, however, because agreement on a more definitive type could not be reached between BuAer and a contractor within reasonable time. Further, firm fixed-price types are often ruled out by both parties to a negotiation because of cost and profit uncertainties. The fixed-price incentive type offers many "middle-ground" advantages in terms of cost-sharing as well as reasonable predictability of program cost limits.

3. FACTORS AFFECTING SELECTION OF CONTRACT TYPE

General guidelines for determination of the type of contract to be used are provided in Section 3-402 of ASPR. An elaboration of ASPR

guidelines is found in Section B, Chapter V of the Navy Negotiators Handbook.

The most important of the factors stated in ASPR for consideration in selection of contract type are: (1) urgency of the requirement; (2) the period of contract performance and length of the production run; (3) difficulty of estimating performance costs due to such factors as lack of firm specifications, the lack of production experience, or the instability of design; and (4) availability of comparative price data, or lack of firm market prices or wage levels.

All of the foregoing factors are often interrelated in a procurement action, and must be so considered in negotiation. As will be noted later, difficulty in reaching agreement on estimated production costs is often the determining consideration in use of a particular contract type.

Ideally, there should be nothing more to the selection of a contract type for a particular procurement than the application of the published guidelines provided in present regulations. This ideal, however, is far from reality. Innumerable variables appear in each procurement which make that situation more or less different from all other procurements. Selection of contract type is not only closely related to price, which in turn is dependent upon the availability of

adequate cost experience, but also to many other limiting conditions within the military establishment and the contractor's organization. These factors are reviewed in this section.

(1) Funding Delays Often Force Usage of Letter Contracts To Meet Lead Time Requirements

One of the causes of pressures on the Bureau to issue some form of contractual authorization to meet lead time requirements has been the delay in receipt of program funds from the Congress at the beginning of each fiscal year.

The Department of the Navy's procurement process cannot, by law, begin until an appropriation act has made the necessary funds available. The appropriation must then be apportioned by the Bureau of the Budget, Department of Defense and by the Navy Comptroller. Within the Bureau, funds are distributed by the BuAer Comptroller to the cognizant program officer in the research and development production or maintenance division concerned. The program officer, in turn, makes funds available for individual procurements under the program.

The longer the delay in passage of the appropriation act by the Congress and in the apportionment process, the greater the pressure to provide prompt authority to contractors so that

procurement of necessary materials and services to meet fleet deadlines can begin. Without funding authority, procurement requests are held up. This in turn prevents the initiation of the contracting action.

When funds finally are made available, the available time remaining in anticipation of the schedule established by the Chief of Naval Operations, and in consideration of the lead time required by the contractor, may have been reduced to the point where a letter contract is considered to be the only means of giving the contractor a prompt go-ahead. This situation has been particularly acute in the 1958-1959 fiscal year. Receipt of funds by BuAer has been delayed over three months from the beginning of the program year. Programs will be delayed by an equivalent amount of time.

(2) Program Production Status Is a Major Factor in Determining Type of Contract

As noted previously, a major responsibility of BuAer is to meet fleet delivery requirements for new aircraft. To the extent that these requirements represent follow-on procurement with relatively firm design, opportunities for use of high incentive contracts are increased. On the A3D, F9F-8 and F8U-1 programs, for example, sufficient production experience had been developed

by the time contracts for later models were negotiated to permit use of fixed-price incentive contracts. It is to be noted, however, that at least two years is normally required after first flight for this production experience to accumulate. In the A4D program, for example, only 9 planes had been built in the 12 months after first flight, and 14 in the next 12 months. The first fixed-price incentive contract in this program was not issued until 34 months after first flight.

On the other hand, development of new aircraft models involves more uncertainties in cost estimates and therefore requires the government to share most, if not all, of the financial risk, by means of cost-type contracts. This type of contract has been necessary in the early stages of each of the case study programs. The P6M program is a particularly cogent example, since the XP6M represented a substantial change in the state of the art over the P5M. In addition, one result of the crashes of the two experimental models was that costs on the YP6M and P6M-2 contracts could not be reasonably predicted without additional flight experience. Letter contracts and subsequent CPFF contracts were appropriate under these conditions.

(3) Availability and Predictability of Cost Data Have an Important Bearing on Selection of Contract Type

A major factor for consideration in selection of contract type is the availability of adequate cost data. To this end, the contractor's cost accounting system must be capable of accumulating such costs by contract number. Also, once these data become available, there still remains difficulty in reaching agreement on how they are to be projected to determine future costs.

The availability of cost data and difficulties in projecting them are reviewed in detail in the section of this chapter entitled "Contract Pricing." Their significance is cited here to indicate that they are one of many factors affecting selection of contract type.

(4) The Fleet Introductory Replacement Model (FIRM) Plan Requires the Usage of Letter or Cost-Type Contracts for Early Production Models

On the basis of the case study of the F8U-1 program, it appears the adoption of the Fleet Introductory Replacement Model (FIRM) plan has had a substantial effect on contract type selection. This plan calls for. (1) the acceptance of only limited numbers of aircraft prior to accomplishment of essential qualification tests

and evaluations, (2) placing emphasis on designing the initial article for quantity production, and (3) producing the initial production aircrafts on tooling designed for production of higher quantities. Initial production aircraft are intended for test and evaluation by: (1) the contractor, (2) Board of Inspection and Survey (BIS) (3) Research and Development Projects (TED) (4) Accelerated Test, Indoctrination and Operational Evaluation (FIP) and (5) Operational Development Force (OpDevFor).

Exhibit VI, following this page, illustrates the basic principles of scheduling early production of aircraft under the FIRM plan. This schedule, which was developed by BuAer's Production Division, is an optimum one. Actual FIRM plan deliveries in the F8U program have been considerably slower than those scheduled in the basic plan.

"Go-ahead" must be given to the contractor by BuAer for at least limited quantity production prior to first flight of the new aircraft model. Further, the slow build-up in quantity per month starting in the 28th month after production go-ahead means that very little cost experience will be available by the time the contract for the next program year is to be initiated. These factors establish the situation wherein the use of letter contracts, or cost-type contracts at best, is dictated.

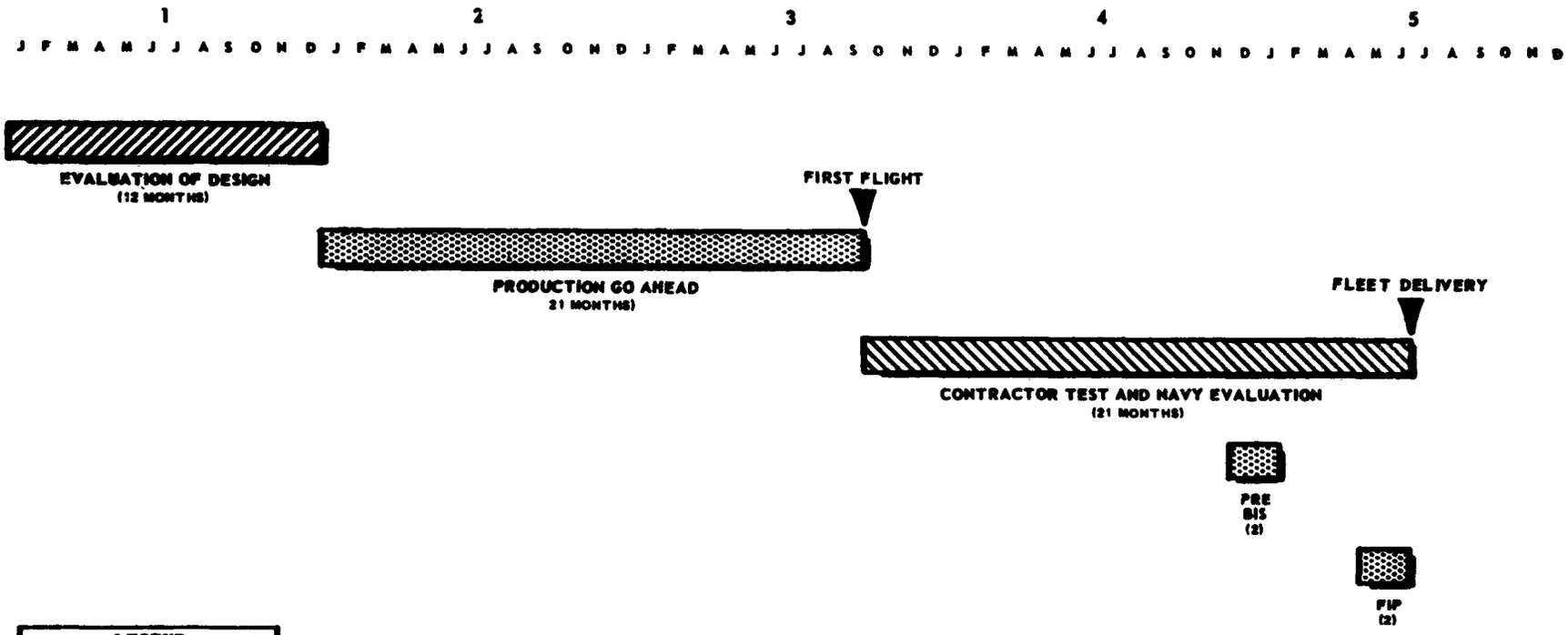
471-6-4513

EXHIBIT VI

BUREAU OF AERONAUTICS

DEPARTMENT OF THE NAVY

FIRM PLAN SCHEDULE-
TYPICAL CARRIER BASED FIGHTER PROGRAM



SOURCE:
BUAER LTR AER PD-20
OCTOBER 22, 1956

BOOZ · ALLEN & HAMILTON

MANAGEMENT CONSULTANTS

Even though the F8U program has been relatively successful in getting qualified airplanes to the fleet at an early date, it has been necessary to use letter contracts and cost-type contracts for early production aircraft. The F8U program history in Appendix B shows that at the time letter contract NOas 54-605 was issued for the first five test aircraft, first delivery of the two experimental models was at least 10 months away. At the time of conversion of this contract, only the two X-models had been delivered. This cost experience was insufficient for negotiation of any type of contract except a cost contract. Further, by October 1954, when the contract for the 1955 program was negotiated , no aircraft had been produced or flown. Consequently, the next contract (NOas 55-170) was originated in letter contract form.

In summary, if contractor production is to be maintained in any degree of stability, contracts for follow-on production under FIRM plan programs must be issued prior to obtaining sufficient experience which would permit development of reasonably reliable targets or firm costs. Further. any delays in receipt of fund authorization by BuAer may require the issuance of letter contracts to meet lead time requirements.

The point at which it will become feasible under the FIRM plan to use an incentive type of contract, by reason of firmness of design and availability of cost experience, probably falls somewhere between first flight and completion of Board of Inspection and Survey (BIS) trials. The exact point will vary with each program, but will depend upon the degree of advancement in the state of the art which is represented by the particular aircraft and upon the rapidity of production build-up.

(5) The Contractor's Financial Status and Volume of Business Affect His Acceptance of Contract Type

The willingness of the contractor to accept a particular type of contract appears to be influenced considerably by his financial and business status at the time of negotiation. As money becomes tighter and business prospects become less encouraging, the contractor is more reluctant to assume the relatively higher risks of fixed price or high incentive contracts. Companies like Douglas and Grumman, for example, have recently gone through very lengthy negotiations with the Bureau and have expressed more interest in cost type than has been the case heretofore. Whether this situation will still hold true in view of the 80% financing clause in cost-type production contracts (required by DOD Directive 7800.6, issued on November 1, 1957) will depend upon each company's particular financial situation at the time.

A low volume of work in a contractor's plant, or possible cutbacks or fluctuations in workload, will have a significant effect on overhead and other costs. Contractors affected by these factors will be less able to project costs accurately and will be less willing to negotiate fixed-price or incentive-type contracts.

The BuAer negotiator needs to be informed currently on the contractor's present and future circumstances in order to know the contract types which will be acceptable to the company. He may find that the contractor is unable to assume a high risk contract even though this might be preferable from the standpoint of the Department of the Navy.

(6) Facility Availability May Delay Negotiation and Affect Selection of Contract Type

Under present procurement regulations, a supply (production) contract cannot be signed until necessary facilities contracts have been approved. The question of ownership of and payment for facilities, as in the case of the YP6M static test fixture, will affect the determination of overhead rates in the supply contract, and may take an extended period to resolve.

In other programs, the question of location of the plant to be used for production has a major effect on the determination

of projected costs, and thus on contract type. In the Sparrow III program, for example, the question of whether the missile would be manufactured in Lowell, Massachusetts, or in Bristol, Tennessee, had not been resolved at the time authorization for lead time items had to be issued. Accordingly, it was impossible to estimate the production costs and a letter contract was necessary to give the contractor a "go-ahead." Under such conditions, a target price or firm fixed price would have been impossible to calculate on a firm basis.

(7) Compared to Production Costs, Administrative Expense Differentials of Various Contract Types Have Relatively Little Significance

As far as could be ascertained during the course of this study, the differences in administrative expense in accounting, auditing, pricing and supervision among various types of contracts are relatively minor factors compared to total cost differentials which could result from the use of a particular contract type.

Although it is true that the firm fixed-price contract does require less administrative expense for both the contractor and the government, these savings are of little consequence unless the contractor has nothing but firm fixed-price contracts in his

plant. This condition is highly unlikely under present procurement conditions.

The government's accounting system does not provide for an accurate evaluation of the costs incurred by the Navy in administration of a particular contract. There is no breakdown of such costs by contract type or by contract number. However, interviews during this study have revealed that contractor accounting practices and Navy auditing procedures are not significantly affected by contract type under the comprehensive audit approach adopted by the Navy in recent years. Emphasis is now placed by the auditor on verification of accounting controls and spot check of all transactions regardless of contract type. Although there remain a few differences in audit and accounting procedures between cost and fixed-price types, these differences are minor as long as there are some cost-type contracts present in a contractor's plant.

The use of firm fixed-price or fixed-price incentive contracts cannot be justified on the basis of administrative costs or savings alone.

* * * *

In summary, selection of contract type is dependent upon many factors other than price. These include: funding, cost experience, program scheduling, facilities, the contractor's business status and cost accounting system. Administrative cost differentials are not significant. The next section discusses contract pricing and its relationship to contract type in detail.

4. CONTRACT PRICING

The establishment of a valid and justifiable price to be paid by the government for an aircraft is a major responsibility of the negotiator in the Contracts Division. He attempts to evaluate the contractor's proposal on the basis of: (1) a verification of actual costs incurred; (2) a projection of labor, overhead, material and miscellaneous direct costs over the life of the contract on the basis of actual costs and (3) the reasonableness of the profit or fee. The basic considerations in contract pricing are the following.

(1) Contract Price and Type Are Inextricably Interrelated

Total contract price cannot be separated from contract type in the negotiation process. When the Navy and the contractor are in relatively close agreement regarding price, use of a fixed-price type of contract becomes most feasible. The further apart their cost estimates are, the more likely will be the use of a letter contract or cost-type contract.

The most recent F9F-8T follow-on negotiation provides an excellent example of this interrelationship. The original request for proposals was based on use of a fixed-price incentive type of contract. When the use of a firm fixed-price type was subsequently proposed by BuAer, the contractor stated that an additional 15% would have to be added to his price to cover contingencies.

Another example involves the A3D program. Letter contracts on NOas 52-981 for the A3D-1 and 54-249 for the A3D-2 were converted in late 1954 to fixed-price incentive contracts. However, the follow-on contract (NOas 55-190) for A3D-2 was merged with the two prior contracts and converted to a CPFF type in the fall of 1956 because of inability of the contractor and BuAer to agree on a target cost. Douglas was willing to accept a lower price under a cost-type contract in order to preclude the possibility of financial losses if actual costs exceeded the estimate.

(2) Contract Price Is Largely Determined by Projection of Contractor's Past Cost Experience

The general categories of cost breakdowns necessary for a complete analysis of contractor's proposals are indicated in Exhibit VII, following this page. This outline indicates only the broad types of data which the negotiator must have; each category

EXHIBIT VII

Bureau of Aeronautics
Department of the Navy

GENERAL CATEGORIES OF COST DATA REQUIRED
FOR DETERMINATION OF CONTRACT PRICE

	Actual	Estimate To Complete	Total at Completion
Engineering			
Direct Labor			
Overhead			
Material			
Total Engineering			
Tooling			
Direct Labor			
Overhead			
Material			
Total Tooling			
Production			
Direct Labor			
Overhead			
Material			
Equipment			
Raw Material			
Purchased Labor			
All Other Material			
Total Material			
Total Production			
Direct Charges			
Wind Tunnel Tests			
Travel			
Taxes and Insurance			
Printing			
Miscellaneous			
Grand Total			

is supported in detail in the contractor's proposal. After the contract is signed, cost data in these categories are obtained from a report entitled "Costs Incurred and Payments Received on Contract" (Form DD1177) which is submitted quarterly by the contractor for each contract.

In analyzing costs, negotiators depend almost entirely on the past cost experience of the particular contractor submitting the proposal. Although some comparison is made on a cost per airframe pound basis through analysis of cost experience on other models, these data serve only as approximate guidelines. The increasing cost of components in relation to the cost of the airframe itself has tended to lessen the validity of cost per pound as a cost yardstick. On the XP6M and XF8U-1 aircraft programs, original estimates based on a cost per pound comparison with other models were substantially below ultimate costs. The use of different materials and different fabrication methods to meet advanced design requirements for these models were major causes of production cost increases which were not foreseen at the time of negotiation.

Direct labor hours for production, engineering and tooling are of major importance in estimating dollar costs, since they represent or control the bulk of the costs. Direct labor hours

are projected over the designated production quantity on the assumption that the amount of manufacturing labor required per aircraft will decrease as each succeeding aircraft is produced in accordance with a "learning curve" formula. This formula has become generally accepted industry practice. Differences frequently arise, however, between the negotiator and the contractor regarding its application to production of a given aircraft.

In essence, the pricing of a contract is based on the best available estimate of the cost of the aircraft being procured. This cost estimate is composed of actual accumulated past costs and a projection. The projection must assume that changes of some estimated characteristic will take place over the life of the contract in such things as production efficiency, labor rates, overhead rates and material costs.

Obviously, it is in this projection that considerable differences of opinion arise between the Navy negotiator and the contractor. The resolution of these differences is the major task of the negotiator in pricing a contract.

With the exception of the Sparrow III program, in which contract costs have not heretofore been accumulated separately by the contractor, the types of cost data received by BuAer are

adequate in view of the information generally available in contractors' plants. The difficulty in pricing lies not in the types of data available, but rather in their analyses.

(3) Pricing of Individual Cost Elements Has a Major Effect on the Contractor's Future Operation

In establishing the total price of an aircraft, the negotiator is, in effect, fixing the amount of contractor effort which the government will support. In approving overhead rates, for example, the negotiator fixes the level of administrative expenses and research and development effort.

By acknowledging a high engineering overhead rate, the Navy auditor or negotiator accepts the fact that the contractor is expending a certain level of funds for research, for example, which may or may not be directly connected to the particular production contract. This type of approval, albeit indirect, is one by which the auditor or negotiator (usually a GS-12) actually sets defense policy regarding the support of a company's research and development effort. As a further example of the impact of the contract negotiator upon determining the level and activity of a company's research effort: under Department of Defense cost principles regarding interpretation of the reasonableness of blue-sky research undertaken by a contractor,

the negotiator is supposed to have "assurance that these (research) expenditures are made pursuant to a planned research program which is reasonable in scope and is well managed." This clearly is a matter to be decided by the Office of the Secretary of Defense, not by a BuAer negotiator.

As a matter of fact, if policy regarding the amount of research to be supported in the aircraft industry is not already established at the time of negotiation, the auditor or negotiator is forced to make a contract decision which serves to set that policy for that time and place. This situation again illustrates the need for a basic national air defense procurement policy to serve as the foundation for aircraft procurement.

The inclusion of an escalator clause or other allowance for increases in labor rates can have a marked effect on the contractor's attitude in subsequent negotiations with labor unions. The contractor may be more willing to accede to requests for wage increases if he knows that such increases are automatically reimbursable under his Navy contract.

(4) Design Changes Markedly Affect the Ultimate Price of Aircraft to the Navy

Design changes complicate the determination of valid cost estimates. They are a major factor in the increase of the total cost of an aircraft program.

In many of the programs studied, numerous design changes have been evident. In some, such as the P6M-2, the number and scope of changes have been so extensive that the cost information has not been firm enough to permit anything but a cost-type contract to be written. These changes greatly complicate the pricing process because of the difficulty in evaluating their effect on the learning curve.

In the F9F-8T negotiation previously cited, design changes created such differences in that model as compared with the F9F-8 that the production man-hour curve was markedly changed. The F9F-8T is considered by Grumman to be 80-90% in common with the F9F-8. Moreover, the equivalent of one hundred F9F-8T airplanes and over six hundred F9F-8 aircraft had been produced at the time the recent F9F-8T negotiations began. Nevertheless, there still existed a difference of opinion amounting to 1,600 production man-hours per airplane in the view of the BuAer and Grumman negotiators. This variance was due to different

interpretations of the effect of the design changes on the slope of the learning curve. The negotiators were finally able to develop a mutually satisfactory compromise of their separate positions.

To the extent that design changes can be reduced to the minimum number essential to fleet requirements, the contract price can be more accurately established. The earlier in the production run such changes can be incorporated, the sooner the contractor's production learning curve can be restablized and permit valid cost projections.

Design changes also affect total contract price by increasing the scope of the work to be performed. This is particularly evident in cost-type contracts where both the government and the contractor are unsure, at the time the original contract is signed, how the ultimate aircraft should be designed. Even on incentive-type contracts, additional changes in design may be developed which will increase the total amount paid by the government over the original target price despite the fact that they are quoted at "no increase in contract price."

(5) Many CPFF Contracts Have Resulted in Substantial Cost Overruns and, Therefore, Increased Prices

Comparisons of original cost estimates with actual costs available at the time of this study are noted in the case study appendixes for P6M, F8U, A3D and A4D programs.

In general, there have been substantial cost overruns on CPFF contracts in these programs. This is particularly evident in the case of the XP6M, XF8U-1 and A4D-1 planes. Although some overrun is to be expected on cost-type contracts because of the nature of the development and production uncertainties which led to the initial use of this type of contract, these excesses have been large enough to warrant special attention.

The reasons for large overruns on these CPFF contracts are summarized as follows.

1. Inability of the contractor and the Navy to foresee material and labor costs of transonic and supersonic airplanes markedly different in design and fabrication from designs of previous airplanes.

2. Overtime to meet delivery schedules (overtime has since been placed under rigid controls which are again being re-examined).

3. Deliberate underestimating of costs by the contractor in order to obtain the contract.

4. Unforeseen increases in overhead rates due to workload shifts in contractor's plant, particularly, as in the case of McDonnell, where a contractor is engaged in both Navy and Air Force work.

5. More extensive testing than originally estimated due to newness of design and to crashes of experimental airplanes.

6. Costs of design changes not directly covered by change orders.

(6) Final Costs Have Closely Approximated Target Costs on Fixed-Price Incentive Contracts

Fixed-price incentive contracts on which reasonably complete cost data are available indicate that contractors have generally bettered cost targets. In contract NOas 56-502, for example, Grumman's costs are expected to come within approximately 1% of the target. In contract NOas 53-1138, costs were about $1.6 million less than the target of $16.9 million for the F9F-8 airplane.

The betterment of the target does not necessarily mean that the Navy has received the lowest possible price. Rather, this could indicate that costs were predictable early in the contract period. Whether the final price is reasonable depends upon the validity of the target.

Exhibit VIII, following this page, is a summary analysis compiled by the Office of Naval Material of all fixed-price

TARGET
FIXED-P

Contractor	Contract Number	Plane Model	Firm Target Cost	Final Actual Cost	Per Cent Overrun (+) or Underrun (-)	Incentive Share Rate	Target Profit Rate	Final Profit Rate
Beech	51-011	JRB/SNB	$ 11,055,000	$ 10,873,500	- 1.64%	15%	9%	9.5%
	52-900	SNB-5	2,633,020	3,120,100	+18.5	20	9	4.5
	52-1085	SNB-5	1,684,410	1,562,600	- 7.2	20	9	11.26
	53-087	SNB-5	7,056,000	5,916,960	-16.1	20	9	14.6
Bell	51-647	HTL-5	1,241,097	1,161,303	- 6.4	25	9	11.3
Chance Vought	51-498	AV-1	12,939,724	13,466,514	+ 4.1	15	9	9.6
	51-863	F4U-7, AV-1	13,650,000	12,866,653	- 5.74	25	9	10.96
Douglas	51-020	AD-4, N, W	55,093,499	55,661,406	+ 1.03	15	9	8.76
	51-021	F3D-2	39,319,315	38,806,916	-13.0	15	8.5	8.897
	51-654	R6D-1	46,385,253	39,474,000	- 8.4	20	8.5	11.19
	51-141	R6D-1	31,195,010	30,305,000	- 2.85	15	8.5	8.7
	51-630	AD-4B-6	56,110,743	52,332,824	- 6.7	25	9	11.5
Grumman	51-022	F9F(2,5,6)	178,327,516	163,578,000	- 8.27	15	9	11.2
	51-074	AF-2W	40,920,000	34,477,883	-15.74	15	9	13.48
	51-118	SA-16(UF-1)	68,796,000	59,412,600	-13.64	15	9	12.79
	51-230	S2F-1	21,104,009	21,686,900	+ 2.76	15	7.5	6.90
	51-633	AF-2W	7,173,489	6,601,000	- 7.98	25	9	11.95
	51-656	SA-16(UF-1)	16,064,699	14,517,900	- 9.6	25	9	12.62
	51-635	S2F-1 and 2	143,012,872	122,088,494	-14.6	20	8.5	13.39
	53-394	UF-1	12,986,000	11,769,100	+ 9.4	30	9.5	13.58
Hiller	51-158	HTE-1	420,160	526,352	+25.3	15	9	4.2
	51-338	H23A	1,386,500	1,737,150	+25.3	25	9	4.2
	51-644	HTE-2, H23A and B	14,118,300	13,913,537	- 1.45	25	9	9.54
	54-573	H23B	2,743,035	2,952,080	+ 7.6	30	9.5	6.66

EXHIBIT VIII (1)

Bureau of Aeronautics
Department of the Navy

TARGET COSTS, PROFITS AND CONTRACT DATES--
FIXED-PRICE INCENTIVE PRODUCTION CONTRACTS

Firm Target Cost	Final Actual Cost	Per Cent Overrun (+) or Underrun (-)	Incentive Share Rate	Target Profit Rate	Final Profit Rate	Letter Contract Date	Definitive Contract Date	Interim Redetermination Date	Final Redetermination Date
$ 11,055,000	$ 10,873,500	- 1.64%	15%	9%	9.5%	8/8/50	3/21/51	2/4/52	9/8/53
2,633,020	3,120,100	+18.5	20	9	4.5	5/12/52	6/11/53	-	12/2/53
1,684,410	1,562,600	- 7.2	20	9	11.26	6/30/52	6/18/53	-	2/24/54
7,056,000	5,916,960	-16.1	20	9	14.6	9/2/52	6/19/53	10/2/53	9/12/55
1,241,097	1,161,303	- 6.4	25	9	11.3	2/10/51	2/5/53	-	2/17/54
12,939,724	13,466,514	+ 4.1	15	9	9.6	1/15/51	1/10/52	11/(3)/52	11/19/53
13,650,000	12,866,653	- 5.74	25	9	10.96	5/11/51	6/16/52	2/17/53	12/13/54
55,093,499	55,661,406	+ 1.03	15	9	8.76	7/14/50	10/19/51	10/17/52	(2)
39,319,315	38,806,916	-13.0	15	8.5	8.897	7/14/50	1/24/52	8/25/54	1/11/57
46,385,253	39,474,000	- 8.4	20	8.5	11.19	2/10/51	3/13/53	11/16/53	1/16/56
31,195,010	30,305,000	- 2.85	15	8.5	8.7	8/18/50	11/20/52	9/(3)/52	10/13/54
56,110,743	52,332,824	- 6.7	25	9	11.5	2/10/51	4/17/53	8/24/53	8/5/57
178,327,516	163,578,000	- 8.27	15	9	11.2	7/14/50	6/13/52	7/18/52	12/20/56
40,920,000	34,477,883	-15.74	15	9	13.48	8/8/50	11/26/51	7/1/52	6/21/55
68,796,000	59,412,600	-13.64	15	9	12.79	8/22/50	11/26/51	4/(3)/52	7/5/56
21,104,009	21,686,900	+ 2.76	15	7.5	6.90	10/6/50	3/2/52	8/26/53	12/20/56
7,173,489	6,601,000	- 7.98	25	9	11.95	2/10/51	7/11/52	1/30/53	6/22/56
16,064,699	14,517,900	- 9.6	25	9	12.62	2/10/51	10/31/52	8/12/53	6/8/56
143,012,872	122,088,494	-14.6	20	8.5	13.39	2/10/51	3/2/53	1/6/55	(2)
12,986,000	11,769,100	+ 9.4	30	9.5	13.58	12/15/52	5/13/54	12/(3)/53	2/19/57
420,160	526,352	+25.3	15	9	4.2	8/23/50	6/9/51	-	9/17/53
1,386,500	1,737,150	+25.3	25	9	4.2	11/22/50	6/19/51	-	2/9/54
d B 14,118,300	13,913,537	- 1.45	25	9	9.54	2/10/51	9/29/52	3/4/53	(2)
2,743,035	2,952,080	+ 7.6	30	9.5	6.66	3/12/54	9/15/54	-	(2)

Contractor	Contract Number	Plane Model	Firm Target Cost	Final Actual Cost	Per Cent Overrun (+) or Underrun (-)	Incentive Share Rate	Target Profit Rate	Final Profit Rate
Kaman	51-157	HTK-1	$ 8,152,335	$ 7,877,357	- 3.37%	15%	8%	8.7%
Lockheed	51-652	P2V-5	67,794,308	67,382,381	- 0.61	25	9	9.3
	51-653	P2V-6	12,488,356	11,722,755	- 6.13	20	8.5	10.4
	52-763	WV-2	56,356,261(1)	53,408,690(1)	- 5.2	20	9.0	10.5
	53-604	WV-3	12,253,796(1)	10,983,500	-10.37	15	9.0	11.7
Martin	51-024	P5M-1	49,026,800	45,176,398	- 7.85	15	9	10.7
	51-684	P5M-1G	44,206,000	40,436,769	- 8.5	25	9	12.53
McDonnell	51-023	F2H-2P and 3	114,331,889	108,575,000	- 5.0	20	8	9.5
North American	51-139	AJ-2P	33,545,800	30,679,726	- 8.5	15	9	11.09
Lot I)	51-634	AJ-2-2P	37,488,440	34,358,775	- 8.3	20	8.5	11.1
Lot II)	51-634	AJ-2-2P	6,800,052	6,235,733	- 8.3	20	9	11.6
	51-642	FJ-2	103,509,000	92,896,850	-10.25	15	7.5	10.1
	51-756	XFJ-2 and 2B	3,666,786	3,685,200	+ 0.5	(5 under (10 over	6.5	6.42
Vertol	51-035	HUP-2	32,163,827	31,645,121	- 1.61	15	9	9.4
(Piasecki)	51-648	HUP-2	22,706,921	22,423,072	- 1.25	20	9	9.14
	51-1058	HUP-3	12,589,500	11,190,480	-11.1	20	9	12.63
Sikorsky	51-034	H05S-1	2,493,522	2,168,318	-13.0	15	9	12.6
	51-075	HRS-1 and 2	6,749,077	6,070,837	-10.0	15	9	11.62
	51-220	H04S-1	858,172	829,381	- 3.3	15	9	9.171
	51-649	H05S-1	1,846,929	1,665,000	- 9.8	25	9	12.7
	51-650	HRS-2 and 3	11,775,698	11,043,022	- 6.2	25	9	11.3
	51-1039	H04S-3	2,460,645	2,235,303	- 9.2	25	9	12.4
	53-606	H04S-3	10,273,475	9,397,544	- 8.5	30	9.5	13.2

(1) Represents total contract target cost.
(2) Not redetermined at time of survey.
(3) Data not available.

1

EXHIBIT VIII (2)

Firm Target Cost	Final Actual Cost	Per Cent Overrun (+) or Underrun (-)	Incentive Share Rate	Target Profit Rate	Final Profit Rate	Letter Contract Date	Definitive Contract Date	Interim Redetermination Date	Final Redetermination Date
$ 8,152,335	$ 7,877,357	- 3.37%	15%	8%	8.7%	8/5/50	4/24/52	11/16/53	12/22/55
67,794,308	67,382,381	- 0.61	25	9	9.3	2/10/51	1/26/53	2/23/55	(2)
12,488,356	11,722,755	- 6.13	20	8.5	10.4	2/10/51	4/2/53	5/25/54	(2)
56,356,261(1)	53,408,690(1)	- 5.2	20	9.0	10.5	1/9/52	6/16/54	2/24/56	(2)
12,253,796(1)	10,983,500	-10.37	15	9.0	11.7	12/31/52	6/21/54	3/20/56	(2)
49,026,800	45,176,398	- 7.85	15	9	10.7	7/14/50	7/3/51	1/15/53	1/19/55
44,206,000	40,436,769	- 8.5	25	9	12.53	2/10/51	9/5/52	7/21/53	(2)
114,331,889	108,575,000	- 5.0	20	8	9.5	7/14/50	6/17/52	1/8/53	1/3/55
33,545,800	30,679,726	- 8.5	15	9	11.09	8/18/50	5/6/52	7/28/53	(2)
37,488,440	34,358,775	- 8.3	20	8.5	11.1	2/10/51	12/19/52	8/27/53	12/4/56
6,800,052	6,235,733	- 8.3	20	9	11.6	-	-	5/(3)/53	1/17/57
103,509,000	92,896,850	-10.25	15	7.5	10.1	2/10/51	11/14/52	4/12/54	(2)
3,666,786	3,685,200	+ 0.5	(5 under (10 over	6.5	6.42	3/8/51	8/15/52	9/(3)/51	7/15/55
32,163,827	31,645,121	- 1.61	15	9	9.4	8/3/50	5/13/52	6/12/53	2/2/54
22,706,921	22,423,072	- 1.25	20	9	9.14	2/10/51	11/14/52	12/3/53	(2)
12,589,500	11,190,480	-11.1	20	9	12.63	4/26/51	3/9/53	12/8/53	12/27/55
2,493,522	2,168,318	-13.0	15	9	12.6	8/11/50	5/2/52	4/30/53	3/19/56
6,749,077	6,070,837	-10.0	15	9	11.62	8/17/50	9/20/51	5/29/52	10/13/55
858,172	829,381	- 3.3	15	9	9.171	9/21/50	6/18/52	4/(3)/52	2/13/56
1,846,929	1,665,000	- 9.8	25	9	12.7	2/13/51	6/18/52	4/30/53	8/3/56
11,775,698	11,043,022	- 6.2	25	9	11.3	2/13/51	6/18/53	8/12/53	6/26/57
2,460,645	2,235,303	- 9.2	25	9	12.4	6/27/51	8/24/53	5/(3)/53	11/2/56
10,273,475	9,397,544	- 8.5	30	9.5	13.2	12/31/52	3/12/54	12/(3)/53	(2)

incentive contracts issued since 1951 on which final redetermination has been completed. Because of the time required for contract completion and cost audit, these contracts are several years old and may not necessarily represent current pricing practices.

In analyzing these data, it is significant that of the 47 contracts listed, only 8 involved an overrun. Whether the large volume of underruns was due solely to better management control or to the negotiation of target prices which the contractor knew he could meet is difficult to prove. Undoubtedly, some of the target prices established were relatively "safe" due to workload pressures on the Bureau arising from the Korean War. These pressures delayed establishment of a firm target, generally until the last half or third of the contract period. In any event, the Bureau has been able to predict final costs more closely than on cost-type contracts.

The formation within the last two years of a price analysis staff in the Contracts Division has materially aided negotiators to analyze contractor cost estimates. The assistance of this type of staff should obviate in large measure the problems of inadequate price analyses which were present during the Korean War. Thus, the validity of targets should be improved.

(7) Profit Receives Disproportionate Attention and Emphasis in Aircraft Procurement

Limitations on the rate of profit to be allowed in contracts are provided by law and by regulation. The Armed Services Procurement Act of 1947 (PL 413) provides for a profit ceiling of 15% on CPFF experimental development or research contracts, and 10% on production contracts. The Armed Services Procurement Regulation reduces these ceiling rates to 10% and 7%, respectively.

On fixed-price incentive contracts and firm fixed-price contracts, there are no statutory or regulatory ceilings. In practice, however, BuAer Purchase Branch has instructed its negotiators to limit the original target profit rate on aircraft on fixed-price incentive contracts to 9-1/2%.

Laws, regulations, instructions plus keen Congressional interest and other pressures, force BuAer negotiators to place undue emphasis on keeping contractor profit to a minimum. Compared to profit, the ultimate price of an aircraft to the Navy gets less attention. This is due in part to the fact that profit is more readily measurable than is cost. Cost, which with profit, comprises the total sales price, is more difficult to judge since the items included in it are dependent upon numerous judgments of a technical nature, and no "yardstick" is provided by ASPR or by other directives.

Since cost represents such a substantial portion of total price paid by the Navy, it is evident that the best interests of the government would be served by giving maximum attention to this factor, even to the extent of devoting less time to substantiation of profit rate. Negotiators and those authorities who review negotiation decisions should keep in mind that the total price paid measures the outflow of dollars from the Treasury. The Congress, in response to the public interest, has to provide sufficient tools by which to control profit. Control of total price is the negotiator's job.

In summary, contract price and type are closely interrelated. Cost, the major factor in price, is difficult to project due to design changes and uncertainties of production efficiency and labor and material costs. Profit has received more attention than is warranted by its relative importance in the total price paid for aircraft by the Navy.

5. CONTRACT INCENTIVES

Just as contract price and type are closely related, so too is incentive an integral contract factor. Various types of incentives and their feasibility and effectiveness are discussed in the following section.

(1) Basic Contract Incentives Are: Cost Performance and Delivery; but Performance and Delivery Incentives Are Secondary to More Basic Contractor Motivations

The three basic types of incentives used in aircraft contracts are: (1) cost, (2) performance, and (3) delivery. The first is used extensively by BuAer and AMC in the form of fixed-price incentive contracts, and to a limited extent by AMC in CPIF contracts. Performance and delivery incentives are not currently used by BuAer, and have been used by AMC only on an experimental basis as, for example, in the case of the B-58 contract.

The effectiveness of performance and delivery incentives on the B-58 contract is still subject to considerable debate between the Air Force and the contractor. Despite careful wording of the incentive clauses in the contract, measurement of the achievement of the performance goals is subject to interpretation, and there is still room for substantial disagreement as to whether performance goals have, in fact, been met. Furthermore, ultimate responsibility for failure to meet performance goals cannot be firmly established because of GFE, design changes, administrative action and similar factors that defy precise definition.

In general, B-58 performance has exceeded expectations, while deliveries have lagged. Whether high performance was

due to the contract incentive feature is difficult, if not impossible, to prove. However, it is doubtful that the dollar amount of the performance incentive has been more important to the contractor than its desire to obtain an industry reputation for achieving a major breakthrough in the state of the art. It is likewise doubtful that penalties for late delivery have been severe enough to outweigh the contractor's desire to establish a reputation for timely performance. The weapon system responsibility imposed on the contractor by the B-58 contract undoubtedly added to its incentive to demonstrate a high level of management capability.

The success of Chance Vought in meeting delivery schedules on the XF8U-1 is another indication that a delivery incentive may be secondary to more basic motivations. It is significant that there were no delivery incentives in Chance Vought's contracts for development of this model. Rather, the contractor appears to have been motivated by a strong need to demonstrate that the company had the capability to produce a successful and timely airplane.

In summary, it appears that both performance and delivery incentives may be outweighed by the more basic motivations outlined in Chapter I. Moreover, both performance and delivery incentives can be provided for indirectly through cost incentives, since each has a direct bearing on ultimate cost.

(2) Cost Incentives Have Been Relatively Effective in Motivating Contractors To Reduce Total Costs

As indicated in Chapter I, a basic motivation of the aircraft contractor is to obtain a production contract upon which a profit can be realized. In addition, recent budget shortages have focused increasing emphasis on the possibility of elimination of high cost producers. Therefore, contractors are motivated toward cost control by the incentive to stay in business as well as by the desire to make a reasonable profit on each contract.

Based on the results of interviews and firsthand observations in all of the major Navy aircraft contractors' plants during this survey, it is evident that incentive features of BuAer and AMC incentive-type contracts are felt at management and supervisory levels. Noticeable steps are taken to hold costs in line with targets. At the worker level, however, shop and assembly personnel observed in contractors' plants were cognizant of the contract number on which they were working, but rarely of the type of contract or its incentive features. Standards of performance in the shops and on the assembly line generally are compiled from time studies of standard shop practices, and are applied on a uniform basis without regard to contract type.

Management attention to such standards, however, may vary with the degree of contract incentive present.

The use of any one type of contract in a particular company has little relation to other types concurrently used in that plant. There is no indication that simultaneous use of several different types of contracts within a company has had any substantial effect on plant efficiency.

The current situation at The Martin Company provides an example of this. In addition to its work on the P6M program in its Baltimore plant, Martin is producing a limited number of P5M's and a large quantity of Air Force "Matador" missiles on fixed-price incentive contracts. Each of these projects is under a separate company project manager. There were no indications of increased efficiency on the P5M and the Matador to the detriment of the P6M. In fact, it will be noted from Appendix A that top management of Martin is giving a very considerable amount of attention to the P6M because of its technical and financial problems.

It is important to note that contract cost incentives are effective only to the extent that estimated costs of performance are realistic. Inflated or unrealistically low estimates may

impair management attention to incentive features and, therefore, fail to create any actual economy in performance.

(3) Continued Usage of Letter Contracts, Cost-Type Contracts, or Untargeted Incentive Contracts Throughout an Aircraft Program May Be Detrimental to Production Efficiency

It is important to consider the long-run effect that repeated use of one type of contract may have on management acuity over the life of a program. For example, some contractors have admitted that the use of CPFF contracts for continued production runs is not conducive to efficiency. They state that controls tend to become lax with repeated use of this type of contract. Also, wage negotiations with labor unions are adversely affected. Since this effect would be noticeable only over an extended period of time, this study could not verify the validity of such statements. A similar situation would exist in the continued use of unconverted letter contracts or of untargeted incentive contracts throughout the production period of a program, since these types of contract provide even less cost incentive than a CPFF type.

In consideration of the use of these types of contracts, it is necessary to keep in mind the availability of cost experience upon which a more definitive contract, with higher incentive features, could be negotiated. It is clearly desirable to move

into the direction of high incentive contracts as the program develops and expands, but not to the extent that excessive contingencies are provided in the price negotiated.

(4) The Renegotiation Act Has Been a Major Deterrent to Negotiation and Effectiveness of High Incentive Contracts

Under the provisions of the Renegotiation Act of 1951, as amended, the Renegotiation Board is responsible for determining whether a defense contractor has made excessive profits. This determination is made by application of specified statutory factors to each contractor's renegotiable business for the year. These factors are:

1. Reasonableness of costs and profits.

2. Net worth, with particular regard for the amount and source of public and private capital employed.

3. Extent of risk assumed, including the risk incident to reasonable pricing policies.

4. Nature and extent of contribution to the defense effort.

5. Character of business, including source and nature of materials, complexity of manufacturing technique, character and extent of subcontracting, and rate of turnover.

6. Other factors required in consideration of the public interest and fair and equitable dealing.

By its very nature, renegotiation is an "after-the-fact" review of the price negotiated by the government and the contractor. All of the aircraft companies interviewed in the course of this study have indicated their very strong disagreement with the actions of the Renegotiation Board in interpreting these factors. The general feeling expressed by contractors is that the threat of loss of profits through renegotiation makes acceptance of high incentive contracts not worthwhile. They state that no profit incentives are real under these present conditions.

The following statement published in the annual report of the Grumman Aircraft Engineering Corporation for 1956 is an example of industry attitude regarding the effect of this act on contractor willingness to accept incentive contracts:

> "The financial loss to the company is serious, but the removal of all incentive for efficiency is far more alarming. The incentive type contract, devised to encourage efficient production, provides increased earnings for keeping costs below the agreed upon target. The Renegotiation Board has in 1953 demanded as excessive profit, not only all such incentive payments, but also a part of the initial target profit, thereby defeating the purpose of the incentive contract."

The Renegotiation Act and the interpretations it has been given by the Board have been major deterrents to the negotiation of firm fixed-price contracts and fixed-price incentive contracts

containing a high contractor share ratio. Rather than accept the risk in these contracts, contractors have leaned toward cost and low incentive types.

Thus, although the Bureau of Aeronautics negotiator is required by regulations not to be influenced by the possibility of renegotiation, in actual practice he must contemplate the reaction of the contractor to the effect of renegotiation on his profits. Also, the basis of the original price needs to be referenced in the Bureau's subsequent evaluation of contractor performance submitted.to the Renegotiation Board.

Under present practice, the Department of the Navy, upon request of the Renegotiation Board, submits data regarding the performance of the contractor whose profits are under review. These reports may cover all contracts in a given year or may be in answer to more specific inquiries.

In addition, an annual report, "Contract Performance Report for Renegotiation" (form NavExos 3499) is submitted by the BAR office and forwarded via the Contracts Division, BuAer, and the Office of Naval Material to the Renegotiation Board. Comments are required on this form regarding the following: (1) description of products, (2) nature of jobs, (3) efficiency of

contractor with regard to both delivery and quality requirements, (4) rejection rate, (5) economy in use of facilities, materials and manpower, (6) effectiveness in control of production costs, (7) reasonableness of costs and profits and extent of risk assumed, and (8) contribution to the defense effort.

It is apparent that analyses of all of the foregoing areas require considerable assistance from all BuAer divisions having detailed and direct engineering, production and operational knowledge. A systematic compilation of these data is necessary because reports to the Board are prepared many years after the fact. By the time the renegotiation process is begun, personnel have changed and situations have been forgotten. Obviously, the more complete the data furnished to the Renegotiation Board, the more accurately it can evaluate contractor performance against all statutory factors and thus give credit for profits properly earned.

In summary, cost incentives are applicable and have been effective in a number of procurement situations. Their effectiveness has been diminished, however, by the results of actions taken by the Renegotiation Board.

6. SPECIFICATIONS AND PERFORMANCE GUARANTEES

Each contract for procurement of aircraft refers to specifications which describe the articles to be furnished. These specifications are prepared by the various technical divisions in the research and development group of the Bureau following the development of a basic design concept and some indication of its feasibility. These specifications define in considerable detail the article being procured and establish the performance goals. When the contract is issued, the contractor becomes responsible for complying with the requirements of these specifications.

(1) In the Research and Development Stage, Specifications Are Necessarily Broad and Performance Goals Are, in Effect, Targets

Of necessity, the characteristics of developmental or experimental models are somewhat broad in scope. Neither the Navy nor the contractor is completely certain nor can they anticipate precisely what the final product will be. The development and testing of a basic design help to establish the extent and content of more detailed specifications.

Both static and flight tests involve modifications to design. These are incorporated in revisions of the specifications. Performance goals in such cases are a compromise between the advances in the art which the Navy would like to achieve and the contractor's willingness to undertake something new and untried.

In the research and development period, therefore, compliance with specifications is an attempt to meet an optimistic objective rather than a firm guarantee by the contractor or a firm expectation on the part of the Navy as to an exact performance. In fact, any attempt to require firm guarantees at this point would defeat the Navy's basic purpose in striving to develop the most advanced and best weapons possible.

(2) After Completion of BIS Trials, Acceptance of the Basic Design Establishes the Cutoff Point for Production

Under the FIRM plan, the purpose of the Board of Inspection and Survey (BIS) trials is to evaluate the stability, control and service readiness of the aircraft and its basic components. Following completion of these trials, a Preliminary Evaluation Conference is held to determine action to be taken on the basis of test results. The proposed configuration of the aircraft for fleet delivery cannot be firmed up prior to this conference. Determination of reliability, producibility and maintainability of the design must take place before quantity production is under way. These determinations are possible only after the BIS trials have provided a realistic test of performance. Following this conference, plans are made to commence the Fleet Introduction Program (FIP), which consists of accelerated flight testing at NATC Patuxent River.

The length of time from completion of BIS trials until the configuration is firm and production go-ahead is granted will vary with the difficulties encountered in these trials. The more complex and advanced the design, the more likely it is that this decision will be delayed pending determination of feasibility for fleet use by BIS. It is surmised that the BIS trials of the P6M, for example, will require more test and evaluation time than did those in the F8U program.

(3) After "Cutoff," Changes in Specifications Require More Rigid Scrutiny

Prior to BIS trials, design changes are rather freely initiated by the contractor and the Bureau. After the production design has been firmed up and the decision made to produce aircraft in quantity, only mandatory changes are supposed to be incorporated into the design. By regulation, mandatory changes are those "required for the successful production and functioning of the equipment in service use." In actual practice, however, this mandatory aspect has been liberally interpreted by both the Navy and the contractor.

Changes fall into two categories: Class I and Class II. Procedure for control of these changes is reviewed in detail in Chapter V of this report. For purposes of this discussion, it is

to be noted that Class I changes require formal Bureau approval. It will be pointed out in Chapter V that considerably more effective controls over changes are needed, however, if the cutoff point is to result in anything approaching a "design freeze" and the cost advantages of stabilized production achieved.

(4) Availability of Firm Specifications Is a Prerequisite to Development of Valid Contract Cost Estimates and Firm Pricing Arrangements

The earlier in the program life that firm specifications are established, i.e., the sooner the "cutoff" point is reached, the earlier a definitive, high incentive contract can be written. Firm specifications provide a more tangible and realistic basis for projection of cost estimates.

A major problem in the development of a valid cost basis for contract negotiation is the lack of firm detail specifications at an early date in the process. This situation is created because (1) design requirements are uncertain at the time the contract is written, and (2) tests during development require changes in specifications. As the program passes through the research and development and engineering phases, these specifications become more definite. The more realistic they become and the earlier they can be approved by the contractor, the earlier in

the life of the contract firm pricing arrangements can be agreed upon.

To the extent that the contract negotiator can participate with the cognizant Research and Development Division in reaching agreement with the contractor on these specifications, the subsequent contract negotiation will be facilitated. Conversely, the Research and Development Divisions can assist negotiators in determining the scope of changes in specifications and their effect on the cost of the aircraft. Closer coordination of this type between the Contracts Division and the research and development group appears to be greatly needed.

(5) Enforcement of Contract Performance Guarantees Is Necessary, But Difficult, in the Production Stage

In the research and development period, performance is a goal. In the production stage, it should be considered as an achievable target backed by contractor guarantee. The cutoff point, as previously defined, generally determines the transition from this goal to a definite standard of measurement.

To protect the government's interest in a contract, a "correction of defects" clause is inserted which provides in general that, if the delivered airplane is defective or otherwise

fails to comply with the guarantees of the contract, the government may require the contractor to correct such defects so that the airplane will meet the specifications. Detailed instructions regarding the protection of the government's rights under the "correction of defects" clause are contained in BuAer Instruction 4275.5A dated February 1, 1957. Although in theory these provisions provide adequate protection to the government, their actual enforcement is often difficult.

An example of difficulty in enforcement of contract guarantees was noted in the F8U-1 program. Even though Amendments 11 and 13 to Letter Contract NOas 55-170 for the F8U-1 and F8U-1P incorporated specific guarantees for such items as weight, speed, ceiling and range, the Bureau felt it had no alternative but to negotiate the definitive contract on the basis of reduced guarantees as proposed by the contractor. Another example involves the Air Force contract with Convair for the B-58, in which difficulty has been encountered in enforcement of delivery and performance incentives.

To make "guarantees" and "correction of defects" clauses in production contracts practicable and workable, it is, of course, first necessary that specifications be reasonably attainable in view of the state of the art. Also, they should be measurable

against established criteria and responsibility for their attainment must be clearly defined. Specifications thus incorporated in the contract should remain firm. Alteration or waiver of specification requirements should be a last resort in a production contract. In research and development contracts, on the contrary, such rigid limits are not feasible because of possible inhibition of effort towards a goal which, although desirable, may or may not be attainable.

Recently, the Bureau has intensified its efforts to enforce performance guarantees on production contracts. Whereas the total penalties placed upon Navy aircraft contractors from 1951 to 1956 was less than $250,000, over $3,000,000 in penalties have been imposed since January 1956. This move undoubtedly will cause contractors to take performance guarantees more seriously, but its accomplishment has required considerable effort on the part of the Bureau. Although it is not possible to measure this effort in terms of specific dollar value received, a net over-all benefit is believed to have been achieved.

Despite the fact that guarantees and adherence to specifications are difficult to enforce at best, it should be noted that the contractor's basic motivations generally are to continue to

produce the best, most advanced and most acceptable aircraft. Only with that kind of achievement can he continue in business successfully over the long term.

7. OTHER CONTRACT TERMS AND CONDITIONS

In addition to price, specifications and guarantees, there are a wide variety of terms and conditions which the negotiator must incorporate in the contract. These include the General Provisions, or "boilerplate" on Standard Form 32, as well as special clauses. Through the use of both general and special clauses, the contract becomes an instrument for enforcement of government policy and legislation relative to social and economic aspects of industry. For example, general provisions relating to wage and hour, "Buy America," small business participation, etc., affect the method by which aircraft prime contractors can do business with their sources of labor and material supply.

The contract also becomes an instrument for enforcement of government policy relative to such items as inspection and acceptance, progress payments, security regulations and patent rights. In the absence of clear policy on these matters applicable to each procurement, the contract may in effect establish policy. For instance, requirements

for approval of subcontracts incorporated in a contract may affect the relationship between a prime contractor and his vendors.

An example of a problem area regarding incorporation of some of these special provisions pertains to interpretation and enforcement of patent clauses. The problem is that patent clauses create the need, in the case of some contracts, for lengthy correspondence and discussion with BuAer Counsel on each contract, whereas a standard arrangement could cover patent questions under all contracts. The question of proprietary rights, of course, has long been a significant problem in military procurement. However, it has not been possible within the scope of this study to develop an acceptable solution to the problem.

To save time in contract preparation and negotiation, basic agreements are made with contractors on contract clauses that are to be applicable to future procurements. A separate basic agreement is negotiated for fixed-price type and cost-type contracts. Within each type, "A" clauses and "B" clauses are negotiated to distinguish between those clauses which are included in all contracts with that contractor and those which vary with conditions existing at the time of negotiation.

The advantages of a basic agreement in expediting procurement authorization, documentation and negotiation are evident. This is

particularly true when time pressures require use of a letter contract. The existence of a basic agreement would materially expedite a letter contract by obviating the need for insertion of numerous qualifying and descriptive clauses.

Discussions with contractors during the course of this study revealed that not all basic agreements with aircraft companies are up to date. Douglas Aircraft Company is a specific example of one that is not timely. Additional effort by the Office of the BuAer Counsel, in conjunction with the Contracts Division, appears necessary in order to negotiate both fixed-price and cost-type basic agreements with all contractors on a current basis.

* * * *

In summary, this chapter has indicated interrelationships and considerations affecting contract price, type and incentive. It has also reviewed the other provisions which must be written into each contract. Major recommendations pertaining to these contract factors are presented in the next section.

RECOMMENDATIONS

THE AIRCRAFT CONTRACT

Comments concerning the advantages and disadvantages of various contract types have previously been pointed out in Exhibit IV, following page 97. The limitations and effects of these types have been noted.

To provide guidelines for application of contract type, price and incentive factors and to indicate areas for additional action, the following recommendations are made.

1. SELECT CONTRACT TYPE IN CONSIDERATION OF ALL ELEMENTS PRESENT IN EACH PARTICULAR PROCUREMENT SITUATION

Selection of the appropriate contract type cannot follow a rigid set of rules. This decision requires exercise of sound judgment in determining which type is most reasonable in consideration of all of the elements present in a particular negotiation. Principal factors to be considered are: funding delays, program requirements and schedules, contractor business status, incentives provided, availability of facilities, adequacy of cost data and firmness of specifications.

The foregoing factors should be considered in relation to the particular segment of the aircraft program at hand. Contracts should

be tailored to each particular segment of the program, rather than selected for the entire program.

This recommendation requires no specific action at this time. Rather, it requires continued recognition on the part of the Contracts Division and on the part of those reviewing its activities that no rigid rules for use of specific types of contracts should be applied. Instead, the Director, Contracts Division should assure himself that the best possible judgment is applied in considering the factors applicable to each procurement situation.

2. IN EACH PROGRAM PHASE, USE THE CONTRACT THAT PROVIDES MAXIMUM CONTRACTOR INCENTIVE CONSISTENT WITH THE DEGREE OF CERTAINTY OF SPECIFICATIONS AND COSTS

In arriving at a contract type and profit pattern which will result in a reasonable price, consideration should be given to attaining the maximum incentive possible under the procurement circumstances. Contract terms which give the contractor a real incentive to hold down costs recognize the profit factor as the basic motivating force by which efficiency is to be achieved.

Selection of contract type is interrelated with contract price; both must be considered in the negotiation process. Generally, the most significant requirement in use of high incentive contracts is the

availability of valid cost information; which in turn is dependent upon the firmness of the specifications and the extent of production experience. As more production experience becomes available, negotiators should strive to incorporate increasingly greater incentive features in subsequent contracts.

In general, cost and production experience are related to contract type as follows:

	Contract Type	Production Stage
1.	Firm fixed-price	Continuing, long-run production; minimum of design change
2.	Fixed-price incentive	Follow-on production
3.	Cost-plus-incentive-fee	Initial production
4.	Cost-plus-fixed-fee	Development and testing
5.	Letter Contract	Preliminary design studies; initiation of long lead time procurement

Those responsible for negotiation, however, should consider the foregoing breakdown as representative rather than conclusive. Again, the peculiarities of each contracting situation should be taken into account. The contract with the greatest incentive possible under the circumstances should be employed.

3. RECOGNIZE THE GENERAL IMPRACTICABILITY OF OBTAINING FIRM FIXED-PRICE CONTRACTS UNDER PRESENT PROCUREMENT LIMITATIONS

Although the Armed Services Procurement Regulation indicates the desirability of using a firm fixed-price contract, numerous factors relating to each aircraft procurement make its use impractical in most instances. These factors include: effect of the Renegotiation Act; lack of cost experience due to rapidly changing program requirements and resulting short production runs; and uncertainties facing the contractor regarding his future volume of business.

It has been shown that in most cases a lower total price to the Navy can be agreed upon under a fixed-price incentive contract. Application of firm fixed-price contracts should be confined to long production runs of a relatively simple aircraft (such as primary trainers) and of aircraft in which design has been largely stabilized.

Thus, despite the inherent advantages theoretically available under firm fixed-price contracts, efforts to widen the use of this type should not be encouraged in recognition of the factors that apply to the present situation.

4. UTILIZE FIXED-PRICE INCENTIVE CONTRACTS TO A MAXIMUM DEGREE

Even though the fixed-price incentive type of contract has certain recognized deficiencies, it appears to be the best available contract for use in a wide variety of situations.

The flexibility of the incentive-type contract has many advantages in permitting agreement on pricing terms. In addition, it offers a compromise plan for cost sharing. The increasing use of this type of contract reflects recognition by Bureau negotiators of these advantages.

In view of the limited application of the firm fixed-price contract type, and the substantial cost excesses experienced in cost-plus-fixed-fee contracts, use of the fixed-price incentive contract should be considered whenever availability of cost data and firmness of design permit. The opportunity for government recovery of cost savings through contractor policing of his own operations appear to make use of this contract advantageous in a wide variety of cases.

The Director, Contracts Division should encourage the use of this type of contract whenever the availability of firm specifications and adequate cost data permit.

5. STRIVE FOR EARLIER TARGETING ON FIXED-PRICE INCENTIVE TYPE CONTRACTS

It has been demonstrated that the later in the contract period the firm target is established, the less is the incentive that is provided.

Every effort should be made, therefore, to issue a firm target contract early in the contract period. This should be achieved by advising the contractor of the type of information to be submitted in his cost proposal, by maintaining cost trends on such data to establish projections at as early a date as possible, by follow-up of scheduled conversion dates, and by prompt write-up and clearance of negotiated agreements. If a firm target at outset is not attainable because of lack of cost experience, the probability of attaining agreement by the time 30% of total effort has been expended should be appraised. If it appears that a firm target cannot be reached at least by the time total effort is 50% expended, some other contract type should be utilized. Either a cost-plus-incentive-fee contract or a successive targeting contract (whereby an initial incentive formula remains in effect until sufficient cost experience is available to establish a firm target price) should be utilized.

In general, the Contracts Division has within its jurisdiction most of the foregoing means to permit earlier targeting. Constant close attention to the needs for and benefits of earlier targeting continues to be warranted.

6. USE CPIF TYPE CONTRACTS IN AIRCRAFT DEVELOPMENT PROGRAMS TO PROVIDE SOME COST CONTROL INCENTIVE

In those instances where an approximation of costs can be made with some degree of certainty (but with less certainty than for use of a fixed-price incentive type) a CPIF contract should be used. Provision in this type of contract for increase or decrease in fee provides more incentive to the contractor for cost control than is now evident in CPFF contracts.

To make the use of a CPIF contract feasible, the maximum fee rate should be increased beyond the administrative limitations now applied equally to CPFF and CPIF contracts by ASPR 3-404.3 (c). This limit is 10% of estimated costs for experimental, developmental or research work and 7% for other types, including production. Since contracts on a CPFF basis now tend to reach these limits, an inducement to use a CPIF contract can be obtained only by Secretary of the Navy authorization of a maximum fee in excess of such limits. The ASPR 3-404.3 (c) provides for such action in appropriate cases. After Secretary of the Navy authorization of increased maximum fee, implementation of the recommendation will be the responsibility of the Contracts Division.

7. NEGOTIATE UP-TO-DATE BASIC AGREEMENTS WITH ALL AIRCRAFT CONTRACTORS

To facilitate contract negotiation and documentation, basic agreements should be brought up to date to include all contractual arrangements in effect between BuAer and its major aircraft contractors. These agreements should include all special clauses, such as those pertaining to patents, special tooling and progress payments, which are essential for effective relationships between BuAer and contractors on future aircraft contracts. It is particularly important that such agreements be finalized to permit more prompt negotiation and issuance of letter contracts for emergency procurement. Action in this case should be initiated by the Director, Contracts Division.

8. SIMPLIFY FORMAT OF LETTER CONTRACTS IN THE INTEREST OF SPEEDING UP EMERGENCY PROCUREMENT

Under ASPR Section 3-405.3, letter contracts are required to contain as many definitive contract provisions as possible. This requirement appears to have been strictly interpreted by BuAer, since letter contracts reviewed in the case study programs were generally indistinguishable from a definitive contract except for the absence of prices. In some instances, letter contracts do not include guarantee provisions and correction of defects clauses.

The Contracts Division should request the Contract Clearance Branch of ONM to approve the use of a letter contract incorporating the minimum requirements of paragraph (d) of the above-cited ASPR section, if in fact it is imperative that the Bureau issue a prompt authorization to contractors for long lead time items. This initial document, which could be more appropriately described as a true "letter of intent," should reference the basic agreement. It should then be followed by progressively more definitive contractual documents as definitive specifications and cost data become available. For example, a subsequent letter contract, which more nearly resembles the present format, may be issued at the time the Bureau feels closer agreement on work to be done is necessary but sufficient cost data are not yet available to permit signing of a cost-type or other definitive contract.

9. PROVIDE THE RENEGOTIATION BOARD WITH MORE COMPLETE ANALYSIS OF CONTRACTOR PERFORMANCE AND MAINTAIN CLOSER LIAISON WITH THE BOARD ON RENEGOTIATION ACT MATTERS

To provide the Renegotiation Board with a more complete evaluation of contractor performance under terms of the Renegotiation Act, a regular procedure for accumulation of cost and technical data should be prescribed by the Chief of the Bureau. First, performance criteria for each factor prescribed in the Renegotiation Act should be established.

Second, memoranda should be inserted in the files by each division or office (BAR, Research and Development, Production, etc.) as major events affecting each factor occur. From these data, compilation by the Contracts Division of all facets of contractor performance can be more readily accomplished.

In addition, closer liaison between procurement officials in the Department of the Navy and the Renegotiation Board should be effected. The Contracts Division of BuAer and the Office of Naval Material should provide the Board with a more complete understanding of the objectives of the Navy's aircraft procurement programs, the actual risks encountered by the aircraft industry in meeting these requirements, and the effect of various types of procurement actions on contractor performance.

10. REITERATE BUAER POLICY AND STRENGTHEN ENCORCEMENT OF CONTRACT PERFORMANCE GUARANTEES IN AIRCRAFT PRODUCTION CONTRACTS

Whereas contract specifications may be considered as a goal in research and development contracts, specifications in production contracts should be considered as reasonably attainable standards to be supported by contractor performance guarantees.

These specifications should be based on criteria designed to insure fulfillment of the operational mission of the aircraft. They should

be reasonably measurable with respect to the total accomplishment of this mission and should be incorporated early in the production contract.

To the extent that the prescribed aircraft mission is not met by the contractor, enforcement of specifications should be required or meaningful adjustment in fee or profit made. This enforcement should be based on total aircraft performance, not necessarily on exact compliance with the terms of each individual specification, and should recognize in a realistic manner the respective responsibilities of the government and the contractor for failure to meet the established requirements.

The contractor should be made to feel responsible for support of claims made by him in his initial design proposal. The policy of the Bureau in this regard should be reiterated to the aircraft industry by the Chief of the Bureau, and its enforcement should be carried out by continued efforts initiated by the Director, Contracts Division.

* * * *

In general, the recommendations in this section regarding the aircraft contract do not represent major changes. Nor do they suggest any new contract type or pricing arrangement as a panacea for procurement problems. Rather they are refinements and suggestions for more considered application of the existing kit of contract tools.

In the following chapter, prenegotiation and negotiation steps leading to the issuance of the aircraft contract are reviewed and recommendations made in order to strengthen these processes in a manner commensurate with their importance.

IV. THE NEGOTIATION PROCESS

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Negotiation is the process used by the Department of the Navy to reach agreement with a contractor regarding quality, quantity, type, delivery and price of aircraft required by the fleet. The resulting contract is a vehicle for resolution, documentation and enforcement, not only of the individual procurement action, but also of fundamental government policies. It is not merely a routine formalization. Each major contract is of considerable importance to the stability of the aircraft industry. Thus, negotiation of these contracts plays an important role in formation of Navy-industry relationships.

During negotiation, the negotiator attempts, within the limitations imposed upon him, to prepare a document which will represent an equitable arrangement for both the government and the contractor. The agreement reached may commit the government to expenditures of hundreds of millions of dollars. The P6M program, for example, may reach $500 million in aircraft production costs alone. Clearly, the dollar volume committed and the character of Navy-industry relationship formalized by the negotiated contract are of such importance that maximum attention and support within BuAer to the negotiation effort is warranted.

It is the purpose of this chapter to review the negotiation process as currently practiced in BuAer, and to recommend means by which it may be improved. For purposes of supplying an additional perspective to this process, the negotiation function at the Air Materiel Command is also reviewed.

1. PRENEGOTIATION ACTION

Steps leading up to actual negotiation are discussed in this section.

(1) The Procurement Request Is the Contracts Division's Basic Authorization To Negotiate and To Initiate the Negotiation Process

A procurement request, prepared by the BuAer division which is responsible for originating the program requirement, is the basic authorization for the Contracts Division to initiate a procurement action. For aircraft, this action takes place by negotiation. Procurement requests in amounts over $10,000 require approval by the cognizant Assistant Chief of BuAer; requests over $300,000 require approval by the Deputy and Assistant Chief of the Bureau.

Upon receipt of the procurement request, the Contracts Division requests price proposals from the designated contractor to cover the number and type of aircraft or components specified.

As program funds shift, the size of the "program buy" likewise changes. This, in turn, leads to the need to initiate new procurement requests. Additional requests must then be issued to contractors for submission of cost estimates on the revised numbers of aircraft. Compliance with these requests for additional cost estimates has been time consuming and expensive to contractors. Frequently contractors are compelled to submit major change proposals on a "crash" basis without time for adequate preparation.

(2) Contractor Cost Proposals Are Analyzed by BAR, Navy Audit Office and BuAer Analysts

Contractor proposals are reviewed by the cognizant BAR office and by the Navy Audit Office and submitted to the BuAer negotiator for evaluation. In the programs included in the case studies, it has been noted that BAR offices have provided varying degrees of completeness in their analyses of these estimates. In general, the BAR endorsement has indicated specific costs or rates which are believed to be out of line, but has not always offered a recommended alternative to the Bureau. The more specific this analysis can be, the more informed the negotiator will be as he evaluates the validity of the contractor's proposal and prepares his position on it.

(3) Information Regarding the Extent of Technical Changes Is Obtained from Research and Development Divisions, but Better Communications and Coordination Are Needed

For his analysis of the contractor's cost proposal, the negotiator obtains written comments from the cognizant Research and Development Division regarding the extent of technical changes in the aircraft to be bought. He relates these changes to the cost proposal to determine the validity of estimates for those items which have varied substantially from prior models.

The ability of the negotiator to obtain comments regarding technical characteristics of the airplane has been hindered by the lack of close communication between the Research and Development Divisions and the Contracts Division. The need exists, therefore, for closer and more direct personal working relationships to permit the negotiator to have a better understanding of the technical characteristics of the aircraft and the effect of these characteristics on production costs. Due to the frequent and substantial changes taking place in the state of the art, this type of information is of major importance to the negotiator in his evaluation of the contractor's proposal. Further, these data are often so complex in nature that several discussions may be necessary to give the negotiator a full understanding of engineering, tooling and production techniques involved.

(4) Preparation of Cost Analyses by the Statistics Unit of the Contracts Division Is Valuable but Is Not Available in All Instances

For the past two years, negotiators have had available the services of a statistical analysis staff in the Contracts Division. This new group, which is composed of an economist, three cost analysts and several statistical assistants, maintains company and industry trends to project the following cost factors over the contract period:

1. Material costs

2. Direct labor hours and rates

   Manufacturing
   Engineering
   Tooling

3. Overhead rates

   Manufacturing
   Engineering
   Tooling
   General and Administrative

The projections made by this unit are given to negotiators for their review and utilization in preparing for the negotiation meeting.

To the extent that they have been available, the services of a separate statistics unit have been helpful to negotiators in

their analysis of the reasonableness of the contractor's cost proposal. This unit has been able to relieve negotiators of some of their record keeping and statistical workload, as well as to make a separate evaluation of the validity of the contractor's proposal.

However, the services of this group are not utilized by all negotiators. Some negotiators do not yet accept the thought of letting someone else perform analyses for them. A more significant reason, however, is that the combination of vacant staff positions and heavy workload demands from other sources prevent this group from making a timely and complete analysis for optimum benefit of all aircraft and missile negotiators. At present, there are four vacancies in this group: a cost analyst and three statistical assistants. These vacancies have been unfilled for almost a year because of the ceiling on the total number of personnel authorized for the Contracts Division. Authorization for these additional personnel is necessary if this group is to provide the type of price analyses which negotiators require.

(5) <u>The Present Prenegotiation Review Is Generally Concluded within the Purchase Branch of the Contracts Division and Is of Limited Effectiveness</u>

Prior to entering into negotiation with a contractor, the BuAer negotiator presents to his immediate supervisors, a complete

analysis of the pending contract. This includes: (1) explanation of the contractual plan, (2) pertinent facts of the proposed contract, (3) the contractor's price proposal, and (4) the Bureau's evaluation of the proposal. This meeting is called a "prenegotiation review." Probable areas of difficulty in reaching agreement on price, type of contract and contractual terms are discussed, and guidance is given to the negotiator on the best approach to be taken in the negotiation of these items.

This type of review is of limited effectiveness, however, because it does not obtain the level and degree of top management assistance and support within the Department of the Navy which is warranted by its financial and industry relations significance.

In general, the prenegotiation review is attended by the negotiator, his unit supervisor, the section head, the purchase branch head or his deputy, and by any BAR or Navy (or Air Force) Audit Office representative who is ordered to Washington for purposes of attending the negotiation sessions. A representative of the BuAer Counsel's office may also attend. The Director and the Assistant Director of the Contracts Division attend to the extent their schedule permits. This attendance, however, is not too often. Directors of other divisions, the Assistant Chief for Procurement, the Deputy and Assistant Chief and the Chief of

BuAer have from time to time been invited to attend these reviews but very rarely do so. Representatives from the Office of Naval Material do not attend.

Thus, the top procurement officers of the Bureau do not participate in prenegotiation reviews. By comparison, the Air Force employs a regular briefing procedure for its top procurement echelon.

(6) The Air Materiel Command Utilizes a Formal Prenegotiation Briefing System That Has Proved To Be Beneficial

The Air Materiel Command has a formal system for a prenegotiation presentation up to the level of the Director of Procurement and Production, who has the rank of major general. Under AMC procedures, a prenegotiation presentation to this official on all nonroutine procurement is required. The following situations are considered to be nonroutine:

1. A new contract following the contractor's unsatisfactory performance on a prior contract.
2. A need for significant change in profit pattern.
3. A new procurement substantially increases a contractor's annual sales and production volume.
4. Costs have increased drastically beyond those originally estimated.
5. Items procured have performed poorly and require modification and retrofit.

6. Superior performance indicates justification for additional profit consideration.

7. The procurement obligates a significant portion of the Air Force budget (interpreted as over $10 million).

The procedure for presentation to the Director of Procurement and Production is that of a planned briefing by a price analyst, contracting officer or buyer from the division concerned. This briefing summarizes: the item being bought, the contractor's proposal, AMC evaluation of the proposal; and a realistic appraisal of available courses of action to be followed in negotiation. The briefing varies from one half to two hours, depending on its complexity. In attendance are: the Director and/or Deputy Director of Procurement and Production; Deputy Director of Procurement; Chairman of the Procurement Committee or his representative; the division chief; contracting officer; buyer; price analyst(s); and a representative of the Pricing Staff Division.

This briefing provides the Air Materiel Command top management guidance and support needed by the negotiator. It also establishes a total AMC position for the negotiator to follow in his dealings with the contractor. In the opinion of AMC personnel, this system has been of substantial benefit in preventing contractors from "going over the heads" of negotiators. Since it has been in effect, there has been greater confidence on the

part of negotiators and contractors that they are negotiating a reasonably firm contract. Contractors report that they are negotiating with the Air Force, not with just an individual negotiator.

(7) A Unified Navy Department Prenegotiation Position Is Often Lacking

The absence of BuAer top management and ONM participation in the prenegotiation review often results in the lack of a unified departmental position on the proposed procurement. Officials in the Office of Naval Material and in BuAer outside of the Purchase Branch are not always informed on the important aspects of the contractor's proposal or the alternative positions which the Bureau could take. Further, the negotiator does not always have the benefit of top level guidance and support to his analysis. He may occasionally find that his decisions have been overruled at a higher level. Contractors recognize these deficiencies and go into negotiations with the attidude that the negotiator's statement is not the last word. Frequently, they will go up the chain of command until they get what they believe to be a satisfactory answer.

This situation is obviously undesirable. The top management of the Bureau does not know the amount of contractor proposals; the negotiator believes that he is not being adequately

supported; and the contractor feels that the negotiator does not represent the Bureau's final procurement position.

Further, the negotiator may complete a negotiation only to find that his position has been disapproved by the Office of Naval Material in its business clearance review. An example of the latter occurred on the negotiation of contract NOas 55-125 for the F9F-8 airplane. The unit price and contract type agreed to by the Bureau and the contractor were subsequently disapproved by ONM and new negotiations were necessary. This example is cited to indicate the need for ONM to participate in the contracting process at an earlier stage in order to indicate general limitations within which the Bureau can negotiate. This participation should not in any way limit or inhibit ONM's independent authority to review the Bureau's final agreement with the contractor.

In essence, there is a real need to provide more support to negotiators in advance of negotiation meetings with the contractor. This support involves policy guidance on a wide variety of matters upon which written policies do not exist; it can result in the establishment of a firm Navy position with respect to the negotiation. Only in this manner can the negotiator be on more equal terms with his counterpart from the contractor's organization.

2. CONDUCT OF NEGOTIATIONS

As in the prenegotiation action, the method of conducting a negotiation by BuAer does not befit its importance. Present Bureau negotiation practices are described in this section; Air Force procedure is also noted.

(1) Aircraft Negotiations Are Conducted by Contract Negotiators (GS-12) with Little Direct Supervisory Participation

In the negotiation meeting, the contractor generally is represented by a contracting official and one or more analysts who are familiar with the financial and technical aspects of the proposal. The Navy spokesman is a contact negotiator (GS-12). He may be assisted by one or more less experienced negotiators (GS-11).

In this regard, the Navy representative is often at a substantial disadvantage. He faces across the bargaining table a contractor representative who generally has greater authority, who is more highly paid, and who is familiar with the techniques and costs of the particular airplane under discussion and may be better prepared with factual information. These inequalities have a marked effect on the Bureau negotiator's morale and make his job all the more difficult.

In practice, the BuAer unit head participates directly in actual negotiations only occasionally. Higher level supervisors seldom participate because of the many administrative pressures on them. In the negotiations attended by this study contractor during the course of this assignment, the unit head participated directly only briefly in one and not at all in another. No one higher than the unit head attended either of the two sessions held during the period under supervision.

It is apparent, therefore, that the bulk of the burden of negotiation falls on the negotiator himself. Within guidelines established in the prenegotiation review, he is responsible for determining the reasonableness of the cost quotation and the profit pattern proposed by the contractor. To do so, he must know the characteristics of the aircraft being purchased, the accuracy and validity of direct labor hours, overhead and direct labor rates, and material and direct costs. He must determine that these items are sufficiently substantiated, that they agree with the over-all cost experience of the contractor, and that they reflect the degree of difference in the proposed aircraft from those already produced by this or another contractor. Last, he must be able to deal effectively with the contractor negotiator in resolving, to the Navy's best interests, all of the points at issue between the Navy and the contractor.

(2) BAR and Navy Audit Office Participation in All Major Aircraft Negotiations Is Essential but Not Always Provided

During the negotiation meetings, the Bureau negotiator is often assisted by a representative from the cognizant BAR and Navy Audit Offices. This participation has been irregular in the past years but during the last year has been increasing in frequency as price negotiations become "tighter." Not all major negotiations are so attended, however.

Support by both the BAR and the auditor is essential to all negotiations. These representatives have a direct, firsthand knowledge of contractor operating methods and costs. The negotiator, located in Washington D. C., cannot possibly obtain all of this knowledge. For contracts of small dollar value, this support can be obtained by correspondence. For the larger contracts, which are usually the more complicated, personal participation by these field representatives is necessary in order to answer detailed questions concerning contractor operating practices and validity of cost items which arise in the discussion. In the recent WV-2 negotiation, for example, comments by the Air Force auditor were invaluable to the negotiator in his understanding and appraisal of the contractor's proposal.

One of the reasons why BAR and Audit Office personnel are unable to attend all major negotiations is the lack of travel funds. For example, in the WV-2 negotiation previously cited, lack of funds forced the BAR and Air Force Audit Office representatives to return home before the negotiations were completed. The additional per diem expenditure that would have been required in order to keep these men at work at the negotiations may have amounted to as much as $150. This is insignificant compared to the importance of this negotiation, in which approximately $42 million were involved.

(3) Aircraft Price Negotiations at the Air Materiel Command Are Conducted by Senior Price Analysts

At the Air Materiel Command, the procedure for development of price analyses for aircraft contracts was reviewed. Responsibility for this function is assigned to a GS-15, a Lieutenent Colonel or a Major. These pricing specialists are assisted by a staff which includes a Captain and a GS-12. This group is a part of the Procurement Office of the Aircraft and Missiles Division. Its principal functions are to analyze contractors' cost proposals and to negotiate personally contract price and type. Negotiation of other contract terms and the general administrative responsibilities in the negotiation of aircraft contracts and amendments are handled by the Contracting Officer (usually a GS-12) of the

Weapon System Project Office having cognizance over the aircraft being procured. In this manner, AMC uses its senior personnel for price negotiation. Other contracting personnel, who are comparable in grade to the BuAer negotiator, perform the other contractual duties that are of less direct financial significance.

(4) The Importance of Price Negotiation Warrants Assignment of BuAer's Most Experienced Contracting Personnel to This Function

All of the decisions in a negotiation involve the application of sound judgment in each individual procurement situation. There is no magic formula for negotiation except preparedness with all of the facts, skill and acumen possible under the circumstances. The more experienced the negotiator and the better prepared he is with cost data and technical knowledge, the sounder will be his judgment in committing the government's funds.

To this end, it appears of the utmost importance that the Bureau of Aeronautics assign its most experienced contracting personnel to price negotiations, and that such personnel be supported by all of the cost analyses and technical data available to provide a thorough understanding of the aircraft being bought. In view of the number of dollars involved in a negotiated aircraft

contract and the extent of Navy-industry relationship molded by it, the Bureau of Aeronautics cannot afford to provide anything less than maximum support to this function.

3. REVIEW OF NEGOTIATIONS

Action taken by the negotiator is subject to direct review both within the Bureau and by the Office of Naval Material. The Congress and the General Accounting Office may also review negotiations.

(1) BuAer Review of Negotiations Is Normally Confined to the Purchase Branch

Following agreement between the contractor representative and the BuAer negotiator on all contractual matters, a summary of the entire negotiation known as a "Request for Business Clearance," is prepared by the negotiator. Within BuAer this clearance is approved by the Head of the Airframes Purchase Section for contracts up to $5 million. Contracts over this amount must be approved by the Head of the Purchase Branch.

Normally, business clearances are not routed to the Director of the Contracts Division or to higher procurement authority within BuAer. The Director or the Assistant Director, of course, may be brought in on special or complex problems at any time during the negotiation process.

(2) ONM Approval Is Required on All Letter Contracts and on Negotiated Definitive Contracts and Amendments Over $300,000

The request for business clearance prepared by the negotiator is forwarded from the Bureau to the Contract Clearance Branch, Procurement Division, Office of Naval Material for final approval and authority to contract.

This review, which is made by a Contract Clearance Analyst (GS-13) is an appraisal of the entire contracting transaction. Its purpose is to assure that the Armed Services Procurement Regulation, the Navy Procurement Directives, and other instructions that apply, have been followed. Source selection, contracting method, contract type, price negotiation, cost and profit are all evaluated against policy or current practice for propriety.

The factual information available to ONM reviewers consists mainly of the BuAer negotiator's written summary of the negotiation. Reviewers also have available files of accumulated data on the contractor's past performance and general industry data that may be of comparison value to a particular contract in review. Cost trends are maintained on all major items reported by the contractor on his quarterly cost summary

(DD Form 1177). These data are very similar to those maintained by the Statistics Unit of the Contracts Division.

Final approval of the negotiation is made by the Head, Contract Clearance Branch, who acts for the Secretary of the Navy in this regard. Upon receipt of the approved business clearance from ONM, the BuAer negotiator forwards the contract to the contractor for acceptance. If accepted, the contract is then signed by a contracting officer of the Bureau.

This additional, or "third party," review is an effort on the part of the Department of the Navy to assure that Bureau negotiations are reasonable and proper. The ONM review seldom results in a complete rejection of a proposed contract, although BuAer is frequently called upon to submit additional supporting information or to provide further explanation of proposed contract items. ONM and the Bureau are not always in agreement as to the most appropriate or most desirable contract type, price or terms applicable to each procurement.

(3) Congressional and General Accounting Office Reviews Have a Direct Influence on the Negotiation Function

Because of its importance to national defense, its impact on the national economy and the amounts of money involved, the

aircraft contract negotiated by BuAer and approved by ONM is subject to a number of reviews beyond the Department of the Navy. The General Accounting Office and Congressional committees in particular have been interested in investigating aircraft contracting and reviewing results of negotiations.

These investigations have promoted a sense of conservatism and caution in negotiations on the part of both BuAer and contractors. For example, they have caused BuAer negotiators to tend away from the use of higher incentive-type contracts, such as the firm fixed-price. The negotiator fears criticism in the event the contractor is able to earn a higher profit than was initially anticipated.

4. LIMITATIONS TO MAXIMUM NEGOTIATION EFFECTIVENESS

Many of the factors described previously in this report have indicated the inherent limitations in aircraft procurement. These factors highlight the difference between the BuAer negotiator and a buyer in normal commercial transaction. If the commercial buyer does not think the terms of a proposal are reasonable, he usually can refuse to buy and may look for another source. This degree of latitude does not rest with the BuAer negotiator. He is committed to buy a predetermined item from a predetermined source. He seldom can use as a bargaining

tool the threat to buy elsewhere or even not to buy at all. Consequently, his fundamental bargaining position is weak. This fact, however, makes his responsibility in the negotiating process all the more difficult and important.

These basic limitations are largely beyond the control of the Bureau of Aeronautics. There are, however, more immediate limitations on which the Bureau can and should take action. Specifically, the inequality of experience, cost and technical knowledge, bargaining skill and authority of BuAer negotiators in comparison with industry representatives is a major handicap to effective procurement and should receive top level attention.

Many factors contribute to these inequalities. Principal among them are:

(1) High turnover of negotiator personnel

(2) Insufficient training and guidance of negotiators

(3) Insufficient authority of negotiators

(4) Heavy administrative workload of negotiators

(5) Lack of firsthand knowledge of contractor operations by negotiators

(6) Inadequate facilities for conduct of negotiations

Each of these limitations is discussed in more detail in the following sections.

(1) There Is High Turnover of Negotiator Personnel

The turnover rate of negotiators in the Airframes Purchase Section of the Contracts Division is a major problem. In 1956, the turnover rate in the Grade GS-12 level in this section was 50%. The position of the Head of the Airframes Purchase Section (GS-14) has been vacated twice in the last two years.

The principal reason for this high turnover is the attraction of industry positions at generally higher salaries. The annual salary of a GS-11 ranges from $6,390 to $8,110; that of a GS-12 ranges from $7,570 to $9,290.

(2) Negotiators Receive Insufficient Training and Guidance To Carry Out Their Responsibilities

As a consequence of this turnover, there is a lack of continuity of experience in dealing with a particular contractor. Training and indoctrination time are increased. The time required for the negotiator to gain confidence and experience necessary for negotiation of a sound contract is substantially lengthened.

The Contracts Division of BuAer has begun to expand its internal training program by conducting seminar courses and by contracting for the preparation of procedural manuals. A formal training program for division trainees under the Federal Service

Entrance Examination program is under way and plans for a negotiator training program have been developed. Further, at the request of the Contracts Division,ONM has provided two basic courses in fundamental Navy procurement policies and procedures. These are steps in the right direction, but they must necessarily be supplemented by installation of regular progressively advanced training courses for new negotiators.

Negotiators interviewed in the course of this study reported that they have not had sufficient opportunity to receive regular training. They also indicated that they did not receive adequate policy and procedural guidance to carry out their responsibilities properly. This situation was also observed in negotiation meetings. This guidance is most important to the negotiator because of the procurement policy implications of the contract which he issues. All of the interpretations of this policy cannot be spelled out in regulation form; they must be continually discussed and explained.

Although weekly branch, section, and other staff meetings are held in the Contracts Division to review division policy and procedure announcements, apparently such information is not always received by negotiators. Better communications are necessary regarding: changes in procurement policy and

regulations; implementation of instructions; methods of analysis of proposals and conduct of negotiations. More frequent staff meetings for negotiators to review policies and procedures and to exchange ideas and experiences would assist in improving these communications.

(3) Negotiators Have Limited Authority To Make Contractual Agreements and, Therefore, Do Not Fully Represent the Bureau in Negotiations

Although the position description of contract negotiators, GS-11 and GS-12, implies that they have the authority to speak for the Bureau in conduct of negotiations, in actual practice they do not have authority comparable to that of their contractor counterpart. In the negotiations observed during this study, the BuAer negotiator frequently had to interrupt the meeting to seek out his supervisor to clarify a point or get a decision on a matter. This situation was sharply reflected in the attitude of contractor representatives, who were observed to say such things as: "Let us go see the Division Director to get a decision."

(4) Heavy Administrative Workload Limits the Time Available for Negotiation Preparation

Numerous duties imposed on the negotiator in addition to direct preparation for and conduct of negotiations take a high

percentage of his available work day. Negotiators estimate that they spend about two thirds of their time on other tasks, which include: review of correspondence; follow-up to obtain cost data from contractors, BAR offices and Navy Audit Offices; visits from contractor representatives; preparation of requests for authority to negotiate; preparation of business clearances; preparation of explanation of prior negotiations in answer to Congressional, General Accounting Office or Secretary of the Navy inquiries; and miscellaneous administrative duties.

As a consequence of these demands, the time available to the negotiator to perform his primary job of negotiation is limited. The need to separate these duties from the actual negotiation of contract price and type is apparent.

(5) Negotiators Lack Firsthand Knowledge of Contractor Operations

Interviews with negotiators as well as their comments in negotiations reveal their lack of direct knowledge of contractor operations. Several negotiators, for instance, indicated that they had visited their contractor's plant only once over a period of several years.

The reason for the inability of negotiators to visit contractor plants was formerly attributed to lack of travel funds.

The Director of the Contracts Division has in the past several years requested sufficient funds for such travel. The present travel shortcomings, therefore, appear to be due more to workload pressures and unwillingness of the negotiator to travel than to shortages of funds for the Contracts Division staff.

If the negotiator does not regularly visit the contractor's plant, he is not in an optimum position to bargain with the contractor regarding projections of such items as engineering, tooling and production man-hours, labor rates and overhead rates and material costs. For instance, in the recent WV-2 negotiation, the determination of the number of engineering man-hours required was clouded by the fact that the negotiator did not fully understand the functions and operations of the contractor's engineering organization. A prior visit to the Lockheed plant would have obviated the lengthy discussion and confusion.

(6) Insufficient Conference Facilities Hinder Effective Conduct of Negotiations

Due to the shortage in BuAer of conference space, negotiation meetings as well as general discussions with contractors are often held in open office space. This condition is most unsatisfactory from the standpoint of maintaining privacy of discussion and minimizing distractions.

It is recognized that virtually all other BuAer and Navy offices are faced with similar space deficiencies, and that completely satisfactory working conditions are not possible in the present buildings. However, any means by which additional private negotiation space could be obtained would materially benefit the Bureau's procurement effort.

Also, negotiators are handicapped at times because of lack of sufficient office equipment, such as dictating machines. It would appear that the cost of such equipment is small in comparison with the benefits of more effective negotiation.

In summary, there are a number of immediate and pressing limitations to negotiation which can be corrected by administrative action within the Department of the Navy. Most of this action can be taken within the Bureau of Aeronautics. Recommendations leading toward these actions and thus to an improvement in the negotiation process are presented in the following section.

RECOMMENDATIONS

THE NEGOTIATION PROCESS

Recommendations for improvement of the Bureau's aircraft negotiation function pertain to: establishment of a two-step prenegotiation review; conduct of price negotiations by senior contracting personnel; and additional recruitment, training and funding actions.

1. PRESENT PRENEGOTIATION BRIEFINGS TO KEY BUAER AND ONM OFFICIALS TO ESTABLISH A CONSOLIDATED PROCUREMENT POSITION WHICH REFLECTS TOP NAVY POLICY AND MANAGEMENT DECISIONS

The total BuAer prenegotiation review process for aircraft contracts should be in two steps. The first should be a detailed discussion of the contractor's proposal within the Purchase Branch, similar to the type now held. The second should be a summary of possible courses of action submitted to top management of the Bureau and ONM. This second step should be for the dual purpose of informing top officials of the pertinent aspects of pending negotiations, particularly with respect to program costs, and of obtaining a consolidated Navy position relative to these negotiations. Three actions are needed to implement this program.

(1) Provide for Increased Research and Development Production and Maintenance Division Participation in Purchase Branch Prenegotiation Meetings

Since the contract is the concern of the entire Bureau, in prenegotiation discussions which involve a detailed knowledge of the technical characteristics of the aircraft being purchased, the negotiator should have increased assistance of qualified engineers from other divisions. He should request the cognizant project officer or class desk officer, or his representative, to participate in these discussions whenever design, engineering and tooling factors affecting cost estimates are presented.

This type of joint participation by technical and procurement personnel is necessary to resolve the many questions where specifications, delivery requirements and the like are closely interrelated with price and contract terms. The recent practice of routing contractor proposals to the various divisions affected is not a satisfactory substitute to accomplish this end.

The Director, Contracts Division should request that appropriate personnel from Research and Development, Production, Maintenance and other Bureau Divisions are brought into prenegotiation meetings at the proper time. He should see to it that their participation is sufficient to provide adequate discussion and exchange of viewpoints.

(2) Provide for Appropriate Top Level BuAer Participation in Prenegotiation Briefings

A condensed prenegotiation briefing should be presented by the Purchase Branch to key BuAer officials outlining the extent of contractor cost proposals and alternative courses of action available to BuAer in major aircraft negotiations. This briefing, in summary form, should follow as soon as possible after the more detailed branch meeting has established a recommended BuAer pricing position and possible alternative courses of action. Such a briefing should be held to a minimum amount of time to make it possible for such key personnel as Assistant Chief for Procurement, Deputy Chief or Chief of BuAer to attend.

Attendance at this summary presentation should be dependent on the dollar volume and importance of the procurement and on the extent of unusual problems (such as unrealistic cost estimates or contractor insistence on special terms and conditions) presented in the proposal. Representatives from the Production, Maintenance and Aircraft Divisions and the Systems Director normally should attend. The Assistant Chiefs for Procurement, Research and Development and Field Activities may also be included, as might the Deputy or the Chief of Bureau for contracts involving very large amounts, say over $100 million. The criteria for participation should be the authority of the participant

to contribute to a firm Bureau position on the pending negotiation. Final selection of participants should be the responsibility of the Director, Contracts Division. The Chief, BuAer should assure attendance by those invited.

(3) Arrange for ONM Representatives To Attend Prenegotiation Briefings

One or more representatives from the Procurement Division of the Office of Naval Material should be requested to attend the Bureau's top management prenegotiation briefing in the capacity of observer. They should give advice and recommendations to the Bureau regarding the general limitations within which the Bureau should negotiate. They should not, however, be expected to make final commitments nor should their final review authority be abrogated in any way.

In turn, the ONM representative should obtain from this type of meeting advance information on the background of the proposed contract. This procedure should save time in final preparation and review of the business clearance by: (1) permitting a shorter clearance document to be written, and (2) familiarizing the reviewing staff with data on background conditions which cannot be readily documented.

Action by the Chief of Naval Material is necessary to approve and require this participation by his reviewing staff.

2. UTILIZE SENIOR CONTRACTS DIVISION PERSONNEL TO CONDUCT PRICE NEGOTIATIONS

To strengthen the negotiation position of BuAer, senior civilian and military personnel in the Contracts Division should conduct that part of the negotiation pertaining to price and contract type. Effective execution of this function will require a senior price negotiator equivalent in experience to a Section or Branch Head. This experience will probably be found in grades GS-13 to GS-15 or in the rank of Commander. Present negotiators should assist the senior price negotiator in development of cost analyses, negotiate other contract terms and process business clearances, redeterminations, amendments and miscellaneous documents.

To permit the use of senior personnel for price renegotiation, the general experience level of supervisory personnel in this branch should be built up. This will require a comprehensive career development and training program by which capable new negotiators can be promoted to administrative positions. It will also require reappraisal of the present grade structure by the Personnel Division of BuAer and the Departmental Civilian Personnel Division to assure that adequate caliber of personnel can be attracted and held in these positions.

A re-evaluation of the position descriptions of unit, branch and section heads in the Contracts Division should be made to determine whether the grades now assigned are comparable to proposed job requirements, including price negotiation. The total demands to be placed upon personnel in these positions should be appraised realistically by personnel classifiers in the Department of the Navy and the Civil Service Commission.

Completion of both of these requirements will obviously take some time. It is not to be expected that the present number of senior Contracts Division personnel can handle all price negotiations. It is recommended, however, that this be established as a definite goal and that it receive close attention of the Chief and the Deputy Chief. Follow-up of its implementation should be exercised by the Director, Contracts Division.

3. STRENGTHEN THE NEGOTIATION FUNCTION BY PROVIDING ADDITIONAL STAFF, TRAINING AND FUNDS BY THE FOLLOWING SEVEN STEPS

In addition to the two foregoing major recommendations there are a number of specific steps that can be taken to improve the competence, knowledge and information of the negotiator staff of the Bureau. These are:

(1) Provide Necessary Travel Funds for Participation by BAR and Navy Audit Office Personnel in All Major Negotiations

Sufficient travel funds should be requested of the BuAer Comptroller by the Assistant Chief for Procurement to permit at least one representative from BAR offices to assist the negotiator during the entire period of all negotiation meetings concerning definitive contracts over a minimum amount. In addition, the Office of Comptroller of the Navy should assure that sufficient travel funds are provided to Navy Audit offices for this purpose.

(2) Conduct More Frequent Staff Meetings with All Negotiators To Review Policy and Procedural Instructions and To Exchange Negotiation Experience

Airframes Unit Heads in the Purchase Branch should hold regular staff meetings of their negotiators and senior price negotiators to review new policy and procedures and to exchange information on negotiation practices.

(3) Schedule More Regular Visits by Negotiators to Contractor Plant and BAR Offices

All aircraft negotiators and senior price negotiators should be required by their supervisors to visit their contractor's plant on a regular basis to observe company controls and obtain necessary substantiation and clarification of cost proposals.

(4) Schedule Periodic Exchange Conferences with Air Force Negotiator Staffs

At least annually, BuAer and Air Force senior price negotiators and procurement officials should hold formal conferences to exchange ideas on negotiation practices, training techniques, organization, procedures and staffing patterns. This program should supplement the present informal exchanges in these areas. Action in this case should be initiated by the Director, Contracts Division with the concurrence of the Assistant Chief for Procurement.

(5) Provide Necessary Personnel To Develop a Comprehensive Training Program for Negotiators within the Contracts Division

As already requested by the Contracts Division, a training officer should be provided to implement present plans for regular orientation and on-the-job training programs for all negotiators, senior price negotiators, procurement specialists and procurement analysts. Approval of this request by the Director, Personnel Division is required.

(6) Increase Contracts Division Ceiling To Permit Filling of Vacancies in Statistics Unit

Additional efforts by the Personnel Division should be made to obtain an increase in the present authorized ceiling of the

Contracts Division to permit recruitment of necessary additional cost and statistical analysts.

(7) Obtain Adequate Conference Facilities for Conduct of Negotiations

The General Services Administration should again be requested by the Assistant Chief for Administration to provide additional private conference space for use by BuAer personnel during negotiations. In addition, necessary office equipment such as dictating machines should be obtained for use by negotiators in preparation of business clearances.

These recommendations should result in the type of support to the negotiation process which is warranted by the dollar importance of aircraft contracts. The needs are apparent. Corrective action can be initiated. Additional recommendations, which involve broader aspects of contract administration and control, are presented in the following chapter.

V. CONTRACT ADMINISTRATION AND CONTROL

V. CONTRACT ADMINISTRATION AND CONTROL

The preceding two chapters have discussed the contents of the contract document and the means by which it is negotiated. This chapter reviews contract administration and control after negotiation has been completed. Since the contract itself cannot include all eventualities in the procurement relationships between the contractor and the Bureau, the interpretation and administration of this document is equally important to the total procurement process.

In the period of contract administration, which may last from two to five years, letter contracts are converted to definitive contracts and various contract amendments and changes are issued because of changes to specifications, delivery schedules and quantities. Price redeterminations and contract terminations may also take place. These functions are documented by the Contracts Division at the request of the program officer or project officer.

Control during this period is required over the funds expended under the contract, the extent of changes in contract scope, and the timeliness of contract completion. This control is exercised by BAR offices and by various offices of the Bureau, principal among them

being: Comptroller, Systems Director, and the Aircraft, Contracts, Maintenance and Production Divisions.

To carry out the function of contract administration it is, of course, necessary to have an adequately trained staff and sound procedures. The basic needs in this respect, which will lead to improved contract administration and control, are indicated in this chapter.

The more important ones which are highlighted in the discussion which follows are: decision-making and coordination of aircraft procurement programs on a Bureau-wide basis; decentralization of authority to BAR offices; follow-up on Bureau processing of procurement documents; control of engineering changes; control of program costs; and training and career development.

These particular items are reviewed because discussions with contractors and Bureau personnel have indicated the strong need for greater coordination and speed in obtaining Bureau decisions affecting a contract or a program as well as for improved control of documentation following issuance of the basic contract. Problems for both BuAer and the contractor have been the multitude of changes which have occurred on a particular contract, the mounting costs of aircraft programs and the timeliness of documentation.

Each of these needs is discussed in the following sections. Recommendations for improvement are presented at the conclusion of the chapter.

1. BUREAU PROCUREMENT ORGANIZATION

A review of the Bureau's total organization is presented first to provide a basic understanding of the framework in which contracts are administered and controlled. Comparison with the procurement organization of the Air Materiel Command is briefly noted. Later, needs for increased program control and coordination are discussed.

(1) The Bureau of Aeronautics Is Organized on a Functional Basis

The basic organization of the Bureau, as noted in Exhibit IX, following this page, is a functional one. The line control of the Bureau is through the Assistant Chiefs for Procurement, Research and Development and Field Activities. Within these groups, divisions are established on a functional basis. Divisions such as Production, Contracts, Research, Aircraft, Maintenance, etc., cut across program lines.

Each division of the Bureau is responsible for operating policies, plans, procedures and general administration of all programs within its functional area. Regardless of aircraft

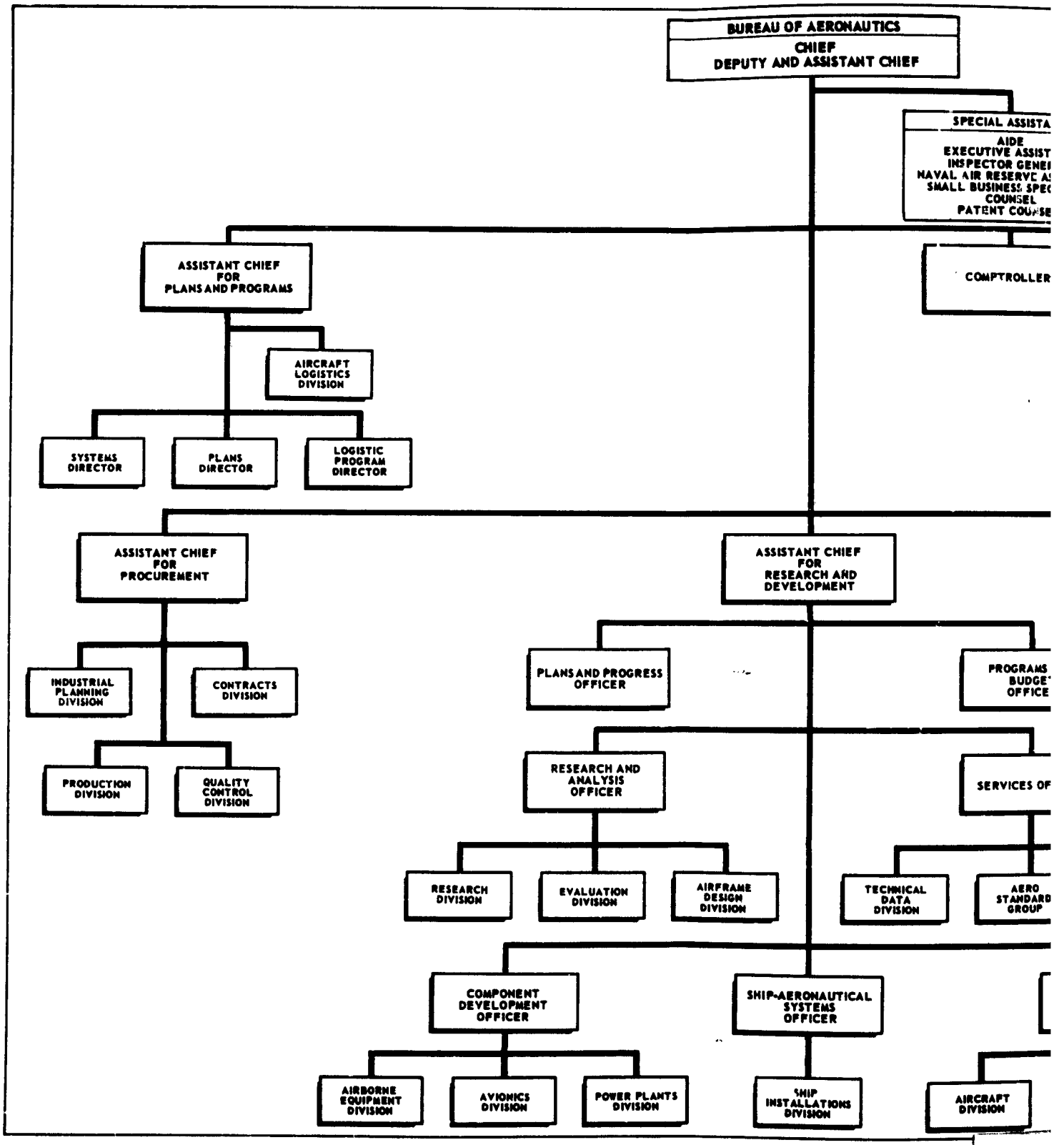
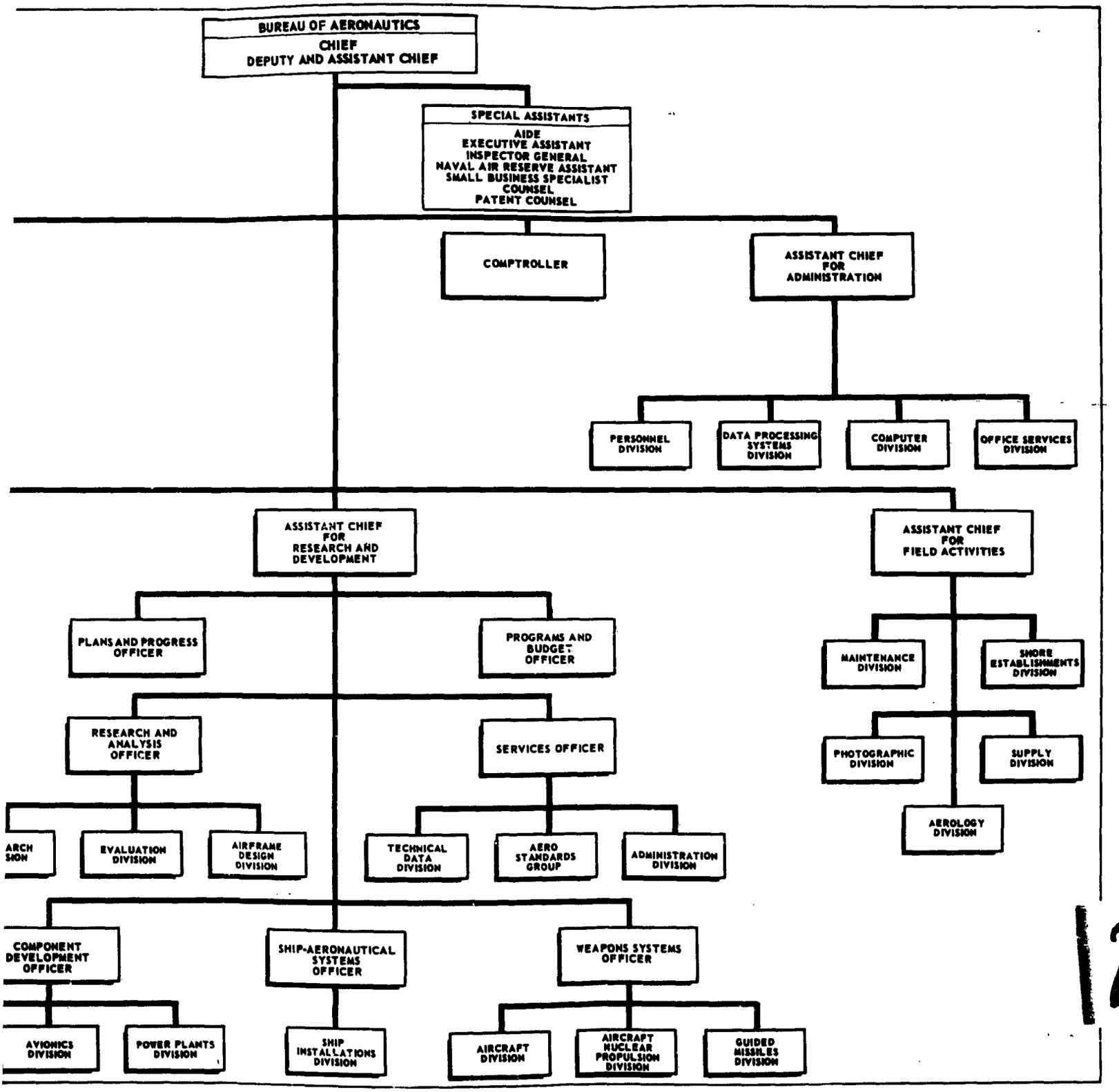

BUREAU OF AERONAUTICS
CHIEF
DEPUTY AND ASSISTANT CHIEF
SPECIAL ASSISTA
AIDE
EXECUTIVE ASSIST
INSPECTOR GENE
NAVAL AIR RESERVE A
SMALL BUSINESS SPE
COUNSEL
PATENT COUNSE
ASSISTANT CHIEF FOR PLANS AND PROGRAMS
COMPTROLLER
AIRCRAFT LOGISTICS DIVISION
SYSTEMS DIRECTOR
PLANS DIRECTOR
LOGISTIC PROGRAM DIRECTOR
ASSISTANT CHIEF FOR PROCUREMENT
ASSISTANT CHIEF FOR RESEARCH AND DEVELOPMENT
INDUSTRIAL PLANNING DIVISION
CONTRACTS DIVISION
PLANS AND PROGRESS OFFICER
PROGRAMS BUDGE OFFICE
PRODUCTION DIVISION
QUALITY CONTROL DIVISION
RESEARCH AND ANALYSIS OFFICER
SERVICES OF
RESEARCH DIVISION
EVALUATION DIVISION
AIRFRAME DESIGN DIVISION
TECHNICAL DATA DIVISION
AERO STANDARD GROUP
COMPONENT DEVELOPMENT OFFICER
SHIP-AERONAUTICAL SYSTEMS OFFICER
AIRBORNE EQUIPMENT DIVISION
AVIONICS DIVISION
POWER PLANTS DIVISION
SHIP INSTALLATIONS DIVISION
AIRCRAFT DIVISION

EXHIBIT IX

BUREAU OF AERONAUTICS

DEPARTMENT OF THE NAVY

PRESENT PLAN OF ORGANIZATION



program, all instructions, regulations and correspondence pertaining to a particular function will originate or clear through the division having responsibility for that function.

Within each division, branches and sections are organized both by function and by end-item group. Within sections, units or "desks" tend to have specialized responsibility for one or more types of aircraft or for major components. For example, in the Contracts Division a negotiator is responsible for negotiating contracts for all aircraft manufactured by a particular aircraft company. A class desk officer in the Aircraft Division is responsible for a specific aircraft type. In the Production Division, sections are organized by function, end-item or on a geographic basis (for production control purposes).

Thus, while Bureau divisions are organized functionally, within each division there are many patterns of organization--functional, end-item and geographical.

(2) Air Force Procurement Organization for Aircraft Centers around a Weapon System Project Office (WSPO)

The basic Air Force procurement organization centers around a complete program or weapon system. The name given to the management group responsible for each weapon system is "Weapon System Project Office," or "WSPO."

The WSPO is a joint Air Materiel Command-Air Research and Development Command group physically located in a single office especially established to manage the development and procurement of a particular weapon system. Its purpose is to "exercise management control of weapon system programs to achieve proper phasing of actions pertaining to development, procurement, production, maintenance and supply, thereby insuring timely delivery and support of weapon systems." For example, the B-58 WSPO has complete responsibility for the B-58 aircraft from initiation of the requirement to its installation in the Air Force regular inventory of airplanes.

The WSPO is a management office. It is not an operating agency. Thus, it does not supplant the regular functions of AMC or ARDC. It may, however, direct the attention of these commands to specific problems that require action. Its staff includes contract administrators, engineers and production and maintenance specialists on assignment from regular AMC or ARDC divisions.

The management and composition of the WSPO follow the evolution of the weapon system. Executive responsibility for the WSPO lies in ARDC for development of entirely new types of aircraft and major aircraft improvements. This executive responsibility shifts to AMC as the aircraft goes into production.

In this period, ARDC serves essentially as a technical consultant. Later, as the aircraft becomes a regular part of Air Force inventory, the WSPO is gradually superseded by the AMC field supply and maintenance system.

In summary, the Air Force approach, as represented by the WSPO, is still in the development stage. It has certain administrative operating problems, such as the dual AMC-ARDC leadership concept, but it appears to be generally effective. It is recognized in the Air Force and by contractors as an influential force in providing necessary central program guidance and direction, and in achieving faster decisions.

The dual AMC-ARDC relationship and the delineation of responsibility between the WSPO and operating divisions of AMC and ARDC are problems that the Air Force must yet solve. However, there appear to be significant advantages to the WSPO concept. Of particular interest are aspects pertaining to the central weapon system management and to the central program staff office. These items warrant attention and consideration by BuAer.

(3) Increased Coordination and Control of the Total Procurement Process Is Required in BuAer

During this study, BuAer and other Navy procurement personnel as well as aircraft contractors have indicated that a

real need exists for greater coordination and control of all elements in the BuAer's procurement process. "Procurement" in this sense refers to BuAer as a whole and not merely to the Office of the Assistant Chief for Procurement. Control by the Contracts Division is only one part of the total procurement control required for effective execution of an aircraft program.

The problem faced by BuAer is that its functional type of organization has not enabled it to keep pace with the growing complexities of modern aircraft and missile programs. As the number of organizational units has expanded to accommodate increased numbers and complexities of Bureau functions, coordination has become more difficult. Procurement action documents, for example, now require extensive routing in order to accommodate all of the approvals, concurrences and comments that are thought to be necessary. Routing is a sequential process which may require as many as 50 or 60 "clearances" before every office gives its approval. Absences of individuals on the route sheet may hold up the clearance process for days.

Contractors as well as Navy personnel complain that they are unable to obtain major decisions and prompt document clearance without special efforts to expedite an action through all of the divisions concerned. Although this complaint may be somewhat

overdrawn, there is still sufficient evidence to indicate the need for more centralized decision-making and coordinating authority over procurement actions within the Bureau.

Historically, the class desk officer in the Aircraft Division assumed responsibility for coordination and control of the technical phases of an aircraft program. As the complexities of aircraft and missile programs increased, however, the interrelationships with other divisions, such as Avionics and Power Plant, have made the technical coordination job much more involved.

In addition, one of the most serious shortcomings indicated by this survey is the relative lack of integration and correlation of the technical decisions with those affecting the nontechnical procurement and contractual aspects of a program. This integration is needed on a day-to-day basis for each program. A purely functional organization requires that this integration be accomplished largely by the top people--the Chief and the Assistant Chiefs--yet the day-to-day requirements for detailed decisions of this type make such a solution impractical. Consequently other means of solution were necessary.

(4) The Program Manager Concept Is a First Step toward Increased Bureau-Wide Program Control

The need for greater program control has been recognized by the Bureau through the establishment of the program manager concept. This concept was announced by BuAer Notice 5430 of September 4, 1956. Under this plan, officers, generally of the rank of Commander, have been assigned to the Systems Director with responsibility for coordinating one or more programs. The program manager "coordinates and expedites all Bureau effort to insure an orderly program for development, production, fleet delivery and fleet operation of a particular weapon system." It is intended that he will provide a single desk within the Bureau to act as an "across the board" monitor of a particular program to see that schedules are established and met.

Each program manager has a designated assistant for production, contracts, maintenance and research and development. All programs have a common assistant for industrial planning, photography and shore establishment functions. These assistants, who are specified in BuAer Notice 5430 of August 9, 1957, are located within their respective divisions and are under the supervision of their respective division heads.

The program manager concept has been in operation only about one year. It is premature, therefore, to attempt a full evaluation of its effectiveness at this time. As might be expected, success in coordinating a particular program appears to be dependent largely upon the abilities of the individual program manager.

Regardless of individual differences in program success to date, however, the program manager concept must be regarded as an essential first step in solution of the need for greater coordination and centralization of program authority. Much remains to be done if effective procurement action is to keep pace with the requirements of the modern weapon system.

(5) Additional Steps Leading toward Stronger Program Direction Are Required To Improve Procurement Control and Coordination

In order to provide more centralized decision-making and coordinating authority with respect to aircraft procurement, there is a need for the Bureau to move more in the direction of an organization plan based on weapon system rather than on the present functional basis.

By providing a single authority over the multitude of related and integrated actions pertaining to the design, development

production, procurement and support of an aircraft or missile, the Bureau should be able to expedite decisions concerning each program.

The ultimate goal would be an extension of the present combination of horizontal functional organization and vertical program organization. It is anticipated that over the next few years as weapon systems continue to expand in scope and grow in complexity, it will become necessary to strengthen the vertical organization in an approach toward line control over all aspects of a given program. On this basis, the functional organizational groups would devote themselves primarily to the important role of policy making, functional Bureau-wide coordination and staff assistance.

These conclusions have been reached in the light of procurement needs generally and contracting needs more specifically. It is recognized that other factors, completely outside the scope of this survey, will affect the ultimate heading of the total BuAer organization and should be considered in determining the advisability of specific organization changes and their timing.

2. FIELD ORGANIZATION

The field organization of BuAer consists of area administrative offices, known as Bureau of Aeronautics General Representatives (BAGR), and in-plant representatives, or Bureau of Aeronautics Representatives (BAR). The BAGR is responsible essentially for broad management and technical control over all BuAer field offices assigned to him within his district. Since the BAGR is not directly concerned with the administration of aircraft contracts, no recommendations are made with respect to this organization.

Specific recommendations are presented at the end of this chapter regarding clarification and strengthening of the role of BAR offices.

(1) In-Plant Contract Administration under Close BuAer Coordination Is Preferable to Centralized Control at the BuAer Level

The principle upon which BAR offices were established is that of in-plant Navy representation to solve common BuAer-contractor operating problems and to provide closer control over contractor performance. The BAR is in constant communication with the contractor and is able to observe his operations at first-hand on a daily basis. Likewise, matters of contract administration can be handled most expeditiously by the BAR office in the plant because of the opportunity to review cost and production records directly and to resolve questions on a person-to-person basis.

The BAR type of organization can be most effective on a decentralized basis wherein the BAR is given authority to do the job at hand with reasonably close coordination by BuAer. This arrangement is preferable to being dependent upon centralized Bureau review and follow-up of every step taken by the contractor. Coordinated in-plant control is more feasible than central Bureau control because the Bureau in Washington cannot possibly know, understand and resolve all of the problems of each contract. It must depend on its plant representative to handle day-to-day contractor questions and to review the results of contractor operations.

The degree of independent in-plant control which can be delegated to BAR offices, however, is directly related to the number and caliber of BAR personnel. As field personnel become better trained and gain additional experience, the Bureau will be in a more favorable position to delegate increased administrative authority to BAR offices. The Bureau has appropriately recognized the experience limitations of personnel in BAR offices in the past and has withheld additional delegation of authority until it could be assured that the BAR staffs were capable of carrying out their increased responsibility. Steps which have been taken to improve the experience level of BAR personnel

are reviewed in this chapter in the section entitled "Training and Career Development."

(2) The Mission of BAR Offices and Their Relationship to BuAer and Contractors Are Not Clearly Understood

The recently published "Field Contract Administration Manual" has assisted Bureau and BAR offices to understand the functions and responsibilities of the BAR. Also, courses are being offered by the Contracts Division to train BAR contracting personnel in techniques of contract administration. These efforts are commendable and should be continued.

It was noted during this survey, however, that there was not a clear understanding by the Bureau and by the contractor of BAR responsibilities and relationships relative to contract administration, inspection, production and engineering.

In general, BAR personnel have indicated that closer coordination between BuAer and its plant representatives is necessary. Further, it is apparent that BAR personnel themselves need to have a closer appreciation of the responsibilities of the Bureau and the contractor. Therefore, both the Bureau and contractors need to understand more thoroughly the assigned mission and responsibilities of the BAR. To this end, the following provisions are necessary on the part of the Bureau:

1. Standard interpretation of regulations

2. Standard implementation of procedures

3. Information regarding Bureau action taken on BAR recommendations

4. Routing of correspondence and clearance of visitors to contractor plants through BAR offices

5. Written confirmation of oral instructions

These needs are restated here to emphasize the importance of closer working relationship between the Bureau and BAR offices.

Likewise, the need still exists for closer understanding by the contractor of BAR functions and responsibilities. This relationship is most significant in the creation of an effective Navy-industry partnership.

(3) The Present Type of BAR Organization Is Suitable for Aircraft Contract Administration

BAR offices are organized along functional lines. A typical BAR office has seven divisions: engineering, contracts, production, inspection, facilities, security and office administration. Each division handles all matters pertaining to its function regardless of source.

In view of the fact that BAR offices have a relatively limited number of personnel in each division to handle the workload, the

functional type of organization appears best suited for BAR offices. In this manner, the BAR office can obtain maximum utilization of its personnel in each of their functional specialities. There are not enough supervisory personnel in each functional area to permit exclusive assignment to one particular aircraft program. For example, in BAR, Baltimore, there are only six engineers in the Engineering Division, two production specialists in the Production Division, and four contracting specialists in the Contracts Administration Division to process all of the work generated by The Martin Company and other BuAer contractors in the Baltimore area, including a branch of Westinghouse Electric Corporation.

It is to be noted that the small size of BAR offices and the few aircraft programs handled by an individual BAR are in contrast to the Bureau's organizational and staffing pattern previously described. Whereas the Bureau's larger size and greater number of programs require movement toward a weapon system type of organization, the size and program responsibilities of a BAR office provide relatively little flexibility. Essential changes required in BAR offices lie not in organization, but in staffing and procedures.

(4) BAR Procedures and Staffing Requirements Need To Be Geared to Increased Weapon System Responsibilities of Contractors

Responsibilities and duties of the BAR are set forth in BuAer Instruction 5451.6. This instruction places responsibility on the BAR for the actual administration and inspection of all government contracts with contractors under his cognizance. Many of the BAR's duties are of such a minutely detailed nature that the office is not staffed adequately to carry them out. As a practical matter, greater reliance should be placed on BAR surveillance of contractor policies and procedures, and less attention should be given to routine verification or approval of specific documents or detailed actions.

This approach to contractor control becomes increasingly important as the Navy assigns additional weapon system responsibilities to prime contractors. The BAR, as the Bureau's field representative, cannot afford to use its limited manpower on detail checking in great measure. The BAR must rely on the contractor for this checking and reserve its manpower for verification of the adequacy of contractor policy and procedural controls and for checking his more important actions.

For example, the Engineering Division of the BAR is required to review all engineering drawings. It is physically

impossible for the few engineers in each BAR office to review thoroughly the thousands of engineering drawings generated by the contractor during a month. Of necessity, the present review is only perfunctory. Some BAR offices only verify that the initials of all necessary contractor personnel are on the drawing. This is clearly an after-the-fact check of little value. A more appropriate evaluation of the contractor's engineering proficiency would be to verify that his control procedures are adequate and that he is in fact using these controls to comply with contract specifications.

A second example pertains to review of subcontracts and purchase orders. This review is for the stated purpose of determining that: (1) the purchase order or subcontract is necessary; (2) the proposed source is competent; (3) the price and pricing terms are reasonable and reflect solicitation of adequate sources; and (4) the contractor is acting to the advantage of the government.

Under present regulations, this review is required for purchases by the prime contractor in excess of $25,000 on fixed-price type contracts, and for all orders on time and material on cost-type contracts. In actual practice, some BAR's review all purchase orders regardless of amount. This procedure obviously is time consuming and is not warranted for small orders. It would

be preferable to verify the adequacy of the contractor's procurement regulations, to see that they are observed by means of spot check, and to review in detail only the orders involving large dollar amounts.

This change will require review and modification not only of Bureau directives and procedures but also of regulations and practices established by ONM which now require this type of detailed review.

In order for BAR offices to be capable of sound evaluation of contractor policies and procedures, it will be necessary to increase the general experience level of BAR supervisory and technical personnel. Increased emphasis on both engineering and management experience will be required since the weapon system concept creates a greater need for a qualitative BAR appraisal of contractor design proficiency, quality control, production capacity and capability and subcontractor selection.

(5) BAR Contracting Officers Have Negotiating Responsibilities but Do Not Have Sufficient Authority To Finalize Their Own Negotiations

In addition to their authority to negotiate call-type contracts for aircraft service change kits and aircraft service changes, BAR contracting officers have been authorized to negotiate amendments

to the basic aircraft contract. This authorization extends negotiation authority for change orders to $300,000 for BAR offices in Baltimore, Bethpage, Akron, Columbus, Dallas, El Segundo and Burbank. The negotiation authority of other BAR offices extends only to $50,000.

In either event, after negotiation, the agreement reached between the BAR contracting officer and the contractor is submitted to the Bureau for formal documentation as a contract amendment. Thus, the contractor must await final Bureau action before receipt of authorization to proceed with the negotiated change. The BAR does not at present have authority to finalize his own action on this type of change.

3. TRAINING AND CAREER DEVELOPMENT

A procurement organization, whether in the Bureau or in its field offices, cannot be a workable and dynamic force without an adequately trained staff. Both military and civilian personnel must be capable of carrying out their assigned tasks if contract administration is to serve the needs of the fleet and is to assure economy in the expenditure of government funds.

(1) A More Extensive Bureau-Wide Career Development and Training Program Is Required

It is recognized that the Bureau has made considerable strides in planning a training program for contracting officers and other contract administrators. BuAer letter AER CT, dated September 24, 1956, for example, has outlined course requirements in the area of contract administration, termination and procurement law. This effort recognizes the need for qualified contract staffs in Bureau and BAR offices and is commendable.

In addition, however, there appears to be a need for the Bureau to develop a more comprehensive plan for a career development and training program of all contract administration personnel. This plan would involve a total integrated program of formal schooling, Bureau training, rotation of assignment, and a procurement career program for aeronautical engineering officers. There is a particular need in such a program for increased business training, both by the Bureau and through more formal schooling.

The need for training applies to both military and civilian personnel in Bureau and BAR offices. Among civilian personnel the need for training is particularly acute in the Bureau because of the high turnover of negotiators and their assistants. Chapters III

and IV have referred to the need for such training with respect to negotiators and have emphasized the importance of maintaining a continuing relationship and experience level in dealings with the contractor.

(2) Key BAR Officer and Civilian Personnel Require Additional Business Training

As a result of interviews with BAR personnel during this study, it was apparent that some individuals in key positions had not had an opportunity for full training and indoctrination. This was particularly noted with regard to officer personnel. Several officers in charge expressed their unfamiliarity with both Bureau and contractor operations upon reporting for BAR duty. In these instances, their assignment as the Bureau's representative was their first tour of duty in a BAR office. Further, these officers admitted that they lacked the opportunity to receive Bureau indoctrination and some type of business training before being ordered to their present billet.

Although the rate of turnover among civilians in BAR offices is not as high as it is in the Bureau, extensive training is still essential, perhaps more so, because of the geographical separation of these offices from each other and from the Bureau.

4. PROCESSING OF PROCUREMENT DOCUMENTS

As noted in Chapter III of this report, the contracting cycle within BuAer begins with the preparation of the procurement request. The contracting documents which result from the origination of the procurement request may take the form of: letter contract, definitive contract, amendment, alphabetical change order, delivery change or termination request. This section discusses the control over these and related documents.

(1) Bureau-Wide Procurement Document Status Is Reported by Office Services Division; Control Is Left to the Director of Each Division

Control of procurement documents within the Bureau is now exercised on two bases. First, each division is responsible for processing documents within its jurisdiction. Second, the Procurement Document Control Branch (OS-5) of the Office Services Division is responsible for recording and follow-up of documents as they move within the Bureau.

Control by the Procurement Document Control Branch is achieved by recording processing time and dates on control cards for each contract. The following documents are controlled at each step as they move from division to division: letter contracts, definitive contracts, amendments, change orders and termination requests.

If processing time at any step exceeds an established standard, a Procurement Document Follow-Up Notice is forwarded to the division director concerned. The reply to this follow-up is submitted to the originator of the procurement request.

The Bureau-wide document control effort by the Office Services Division is basically sound in its procedural aspects, in that it provides a system for recording and follow-up of many types of procurement documents. As noted in the subsequent section, it does not, however, extend to change notices and engineering change proposals nor does it receive top level attention within the Bureau.

(2) The Status of Change Notices and Engineering Change Proposals Requires Central Control by the Procurement Document Control Branch

Control of changes is discussed in the next section of this chapter. However, it is to be noted here that the processing of the various change documents is not controlled within the Bureau by the Procurement Document Control Branch. Consequently, delays in securing approval and documentation of changes have occurred.

For example, information furnished by the El Segundo Division of Douglas showed the following outstanding aircraft engineering change proposals (ECP's) as of September 30, 1957:

	A3D Series	A4D Series
Total number of ECP's in BuAer	89	57
Number of months the oldest ECP has been in BuAer	44	29
Average number of months all ECP's have been in BuAer	10	5

A recent survey by the Aircraft Division disclosed that of 703 ECP's on hand in the Bureau, action had been initiated on only 120. This survey, which was inaugurated on a special project basis, was undertaken for the specific purpose of determining the number of unprocessed ECP's and eliminating as much of the backlog as possible.

(3) There Is No Authoritative Follow-Up of Bureau-Wide Procurement Document Processing

Until recently, the Office of Inspector General was receiving reports prepared by the Procurement Document Control Branch to show the time required for each step of the procurement cycle. These reports were discontinued upon the detachment of the particular officer receiving them. Currently, there

is no analysis made or corrective action taken regarding the total procurement processing time required for various types of contractual documents. There is a strong need for an authoritative follow-up of Bureau-wide procurement to see that action is taken promptly. The Office Services Division, being an administrative service staff, does not and should not have authority to take this action.

(4) The Average Processing Time for Contracts, Including Letter Contracts, Is Approximately Three Calendar Months from Receipt of Proposal to Signature

The large number of reviews of procurement documents as they are routed throughout the Bureau extend the contracting cycle over a considerable length of time. Not all delays are in the Bureau, however. Processing times within the Office of Naval Material and within the contractor's own organization are also substantial at times.

Exhibit X, following this page, is a summary of actual processing time for all aircraft contracts, including letter contracts, on which central control records have been maintained, from receipt of contractor's proposal to contract signature. These data have been compiled by the Office Services Division of the Bureau. Time indicated on this exhibit is expressed in working days.

EXHIBIT X

Bureau of Aeronautics
Department of the Navy

TOTAL AIRCRAFT CONTRACT PROCESSING TIME
(IN WORKING DAYS)

Step	LETTER CONTRACTS (24 Contracts) Range of Processing Time Low	Median	High	DEFINITIVE CONTRACTS AT OUTSET (11 Contracts) Range of Processing Time Low	Median	High
1. Proposal Review and Clearance	13	33	59	5	19	69
2. Negotiation						
(1) Contracts Division	1	8	63	1	16	100
(2) Other	0	0[a]	37	0	0[b]	21
3. Contract Drafting	1	5	20	1	13	26
4. Circulation	1	6	39	1	15	40
5. Contractor Signature	1	4	40	1	5	30
6. Revision	0	0[c]	33	0	4	13
Total Elapsed Working Days from Receipt of Proposal Request to Final Signature	30	68	190	38	91	216

Source: Procurement Document Flow-Time Report (NAVAER Form 5104). Data apply only to aircraft contracts on which Procurement Document Control Branch, Office Services Division, BuAer, has maintained complete control records from receipt of contractor proposal to signature of contract. Records begin in the fall, 1955.

Notes: (a) This step required for only 3 contracts; time required was 1, 32 and 37 days respectively.
(b) This step required for only one contract.
(c) This step required for 7 contracts out of the 24; time required ranged from 2 to 33 days.

Two conclusions are readily evident from an analysis of Exhibit X. First, the average total processing time is at least three calendar months. Second, letter contracts require as many processing steps but slightly less time than definitive contracts. Time saved by use of letter contracts was in the negotiation, contract drafting and circulation steps.

In addition to the data in Exhibit X, time required for processing initial proposal requests was obtained from the files of the Office Services Division for 17 letter contracts. The range of processing time in working days for this step is as follows:

	Low	Median	High
BuAer	10	25	35
Contractor	15	26	98

If this first step is added to the processing times shown in Exhibit X, the total number of working days from initiation of the procurement request to signature of a letter contract is as follows:

	Low	Median	High
Total Processing Time	52	120	269

The number of days required for a procurement request or contract draft to be processed within the Bureau is related

to the number of times that the document must be rehandled as well as to the number of organizational units that review it. In the latter case, the time is lengthened by adherence to a routine of processing as opposed to a selective approach based upon the importance of the subject. For example, contracts and amendments reviewed in connection with the case studies of this report indicated that most of the documents were reviewed and initialed in the same manner regardless of dollar amount involved.

Clearly, the Bureau's objective should be to shorten the procurement cycle as much as possible and to make review and approval practices consistent with the significance of the item being procured.

(5) Recent Efforts by Contracts Division Should Improve Contract Scheduling, Control and Follow-Up

The Contracts Division has recently taken action which should greatly assist in expediting contract issuance. Reports are now being made to the Director at least weekly to indicate the steps at which documents are being held up and what action is being taken to expedite them. In addition, a division-wide workload control unit is being planned. This unit will have responsibility for integrated document scheduling, progress control, signature, follow-up and reporting.

The type of close control which this unit plans to maintain is clearly needed. It can be a significant step in shortening the procurement cycle. The organization plan for its implementation should be installed as soon as possible. Furthermore, this type of program should be extended on a Bureau-wide basis because many of the actions in completing a contract document emanate outside of the Contracts Division.

5. ADMINISTRATION AND CONTROL OF ENGINEERING CHANGES

Under present procedures, an engineering change to aircraft in production or in the fleet may be originated by BuAer or by the contractor. These proposals are termed "Engineering Change Proposals," or "ECP's." Changes are designated as Class I or Class II. Class I changes to aircraft are those which affect: (1) safety of flight, (2) contract specifications, performance or interchangeability, (3) weight, (4) cost, or (5) retrofit. All Class I changes must be processed through the Intra-Bureau Change Committee (IBCC). Class II changes, which are all other changes than those designated as Class I, are approved by the cognizant BAR. This latter type of change is processed with relative ease since neither the contract nor the specifications are affected.

(1) BuAer Has Exercised Relatively Little Central Control over Class I Changes Submitted by Contractors

It is apparent from discussions with the Research and Development Divisions of BuAer and with various contractor engineering departments that both contractors and the Navy have been too liberal in initiating changes which are not absolutely essential--particularly in the light of present fund limitations. These changes consume valuable engineering man-hours, raise procurement costs substantially and delay final delivery of the aircraft.

The large number of engineering change proposals developed for modern aircraft has been a major reason why the IBCC approval procedure has bogged down in actual operation. The number of ECP's on the F8U program, for example, has exceeded 400. The number on other programs is equally high.

In the past, there has been relatively little central control over clearance of requests for ECP's by various Bureau divisions or for screening of ECP's originated by contractors. As a consequence, the number on hand in the Bureau has increased to the point where they cannot be handled promptly.

Under the leadership of the Aircraft Division, a special project was undertaken recently to effect some degree of control

over Class I changes by the cognizant class desk officer. ECP's on hand, some of which were found to be several years old, were reviewed and definite action was taken--either acceptance or cancellation. Of the total of 703 ECP's reviewed, Aircraft Division action eliminated 335. The estimated cost of those eliminated was $50 to $60 million. Also, instructions have been issued placing responsibility on the class desk officer for clearance and follow-up of all requests for major engineering changes, both from within the Bureau and from contractors. To control further the number of ECP's processed, contractors have been requested to submit a list of proposed types of Class I changes for Bureau approval before extensive engineering costs are incurred in design and estimating.

These efforts are certainly necessary and long overdue. Strict adherence to the clearance of ECP's through one control point should greatly reduce both the number of requests for changes and the changes themselves. Additional measures are required to put controls on a routine, rather than on a special project, basis.

(2) Cost Evaluation of Engineering Change Proposals by IBCC Does Not Parallel Evaluation of Technical Feasibility in Time of Review and in Depth of Analysis

At present, ECP's received by the Bureau for approval contain only an approximate cost. This amount is subject to revision within 90 days after approval to incorporate the change is given by the IBCC. This approval is based essentially only on the technical features of the proposed change. The firm amount submitted subsequent to IBCC approval may have no relation to the original estimated amount. This second amount is subsequently negotiated by the BAR and incorporated in the contract as a change order.

Under this procedure, the Bureau has little control over the amount actually paid to the contractor for the ECP. Approval has become an accomplished fact by the time the actual cost is negotiated. Also, the absence of a reasonably accurate cost estimate at the time of IBCC approval of the change means that program funds are being committed for an uncertain amount. This procedure clearly inhibits effective program fund control.

Although it is recognized that precise costs cannot be predicted, nevertheless the IBCC could make a better considered decision if the cost information available to it were approximately

equivalent in accuracy to the technical firmness of the change. More of a balance between cost and technical feasibility is necessary to effect closer control of program funds and to assure that the results of the change are worth the cost.

Preliminary exploration of this idea with aircraft contractors indicates that they can, if required, submit more definitive and more accurate estimates of cost at the time of preparation of ECP's. Some do now. Furthermore, this step would not appreciably delay submission of ECP's.

The final need in control of changes is to provide a balanced decision by the IBCC as to the incorporation of the change and its effective point. This decision should be made by the Bureau after weighing the technical feasibility and desirability against a realistic estimate of the cost of making the change.

6. CONTRACT COST CONTROL

Cost control of aircraft programs is divided among many offices within BuAer. These include: (1) the Comptroller, with responsibility for total Bureau control of obligation and expenditure of appropriated funds; (2) the program officer, with responsibility for planning and control of available funds for designated production, maintenance, research, aircraft and supporting component and facilities procurement

programs; and (3) the program manager, with responsibility for reviewing total weapon system progress, including program expenditures. In addition, the BAR and the Navy Auditor are responsible for review and approval of costs incurred under each contract over which they have jurisdiction.

Responsibilities of program officers for administration of procurement programs are stated in BuAer Instruction 4205.1 of July 28, 1955; responsibilities of program managers for review of program progress are stated in BuAer Instruction 4851.1 of September 17, 1957. The details of these instructions need not be reiterated here. However, it should be pointed out that the latter instruction emphasizes the "present urgent need for complete periodic reports of the status of weapons systems." Present limitations on available funds is a principal factor in this urgency.

The substantial overruns which have occurred in most aircraft programs, as reviewed in the case studies, indicate the need for strong control over contract costs. In the P6M program, for example, cost overruns were: $8.2 million on contract NOas 53-455; $24.7 million on contract NOas 55-535; and $40 million to date on contract NOas 57-161. Undoubtedly, other programs not included among the case studies have experienced similar contract overruns.

The Bureau has recognized this problem and has recently inaugurated a reporting system whereby aircraft contractors are required to submit estimates of expenditures throughout the remaining life of the contract. These forecasts are reported quarterly on DD Form 1097, "Financial Status Report of Contract." Expenditures for each aircraft contract are projected by month through the end of the current fiscal year, by quarter through the end of the following fiscal year, and annually until expiration of the contract period. These data are summarized by means of electric accounting machines and reported to the program officer, program manager, BuAer Comptroller, Chief of the Bureau, and Comptroller of the Navy.

First reports under this system were submitted for the quarter ending September 30, 1957. Undoubtedly refinements in these reports will be necessary to meet BuAer requirements for program data without imposing a large statistical burden on contractors. Such reports, therefore, need to be reviewed periodically in light of total BuAer reporting demands on the aircraft industry. The object of this review should not be more reports, but rather better reports and better use of reports. This review will be most effective if made within established criteria for development of an integrated reporting system designed to provide BuAer top management control of total program status.

* * * *

These foregoing sections have covered the aspects of organization and methods for contract administration and control that have an important bearing on the procurement of aircraft. Recommendations relative to each of these areas are presented in the following section.

RECOMMENDATIONS

CONTRACT ADMINISTRATION AND CONTROL

Recommendations for improvement in contract administration and control are presented in this section. These recommendations pertain to: (1) BuAer procurement organization, (2) engineering changes, (3) BAR procedures and contract authority, (4) career development and training, (5) document processing and (6) contract cost control.

Recommendations in these areas extend considerably beyond the contract function per se. Consequently, within the scope of this survey, they have not been dealt with in the same degree of depth and detail as those directly concerned with the contracting process. In several instances further study is required to develop the necessary plans and programs to implement the recommendations. These are outlined in Chapter VI.

Nevertheless, carrying out these recommendations will have a major bearing on the total effectiveness with which aircraft procurement is accomplished. They should, therefore, receive attention equivalent to that given the recommendations in the foregoing chapters.

1. STRENGTHEN MANAGEMENT CONTROL OF AIRCRAFT PROGRAMS WITHIN BUAER BY ESTABLISHING CENTRALIZED PROGRAM MANAGEMENT

An ultimate organizational goal for most effective control of weapon systems is ideally that of a separate manager with line control over the various functional aspects of each weapon system. However, it is recognized that, while such a plan is advantageous from a procurement and contracting standpoint, there may be offsetting disadvantages of a nonprocurement nature. In any event, steps can and should be taken by the Chief, BuAer to strengthen present program control to provide better coordinated and more expeditious procurement actions.

These steps include some extension of the program manager concept. A partial list of interim actions which should be reasonably attainable in the near future are:

(1) Inform All Aircraft Contractors of Program Manager Functions and Responsibilities and Encourage Contractors To Refer Appropriate Matters to Him

Not all contractors are aware of the program manager's functions and the extent to which he may be of assistance to them. Accordingly, this information should be more widely circulated in the industry by the Chief, BuAer.

More direct contact between the contractor and the program manager should be encouraged relative to inquiries concerning major program developments. Routine contacts and correspondence, however, should continue to clear through the functional division or class desk concerned.

The program manager particularly should be able to provide increased assistance to contractors and to other Bureau divisions in such matters as program plans, program financial status, adherence to schedules, and over-all program review. Delays within any division should be called to the program manager's attention to determine the means by which assistance can be obtained to solve the problem.

(2) Make a Pilot Test of Physical Centralization of Program Manager and Division Assistants in One Office

In order to improve communications between all principal divisions concerned with a program, it appears desirable to group the program manager and his designated division assistants in one office. In those instances where one assistant handles several programs, the workload may have to be rearranged to accommodate the most active programs.

Since scheduling of office space and workload assignments for such a move will necessarily take careful planning, it is

recommended that a pilot move be undertaken under the leadership of an outstanding program manager presently on duty. Based on experience with this test, the Systems Director should decide whether to recommend physical centralization of additional programs.

(3) Increase the Participation of Program Managers in Program Direction and Guidance and Fund Control

Acceptance of an expanded program manager concept will of necessity be gradual. Abrupt reorganization of the Bureau along program lines should not be attempted. It should be possible soon, however, to increase the participation of the program manager in program direction and guidance. Thus, gradual moves toward a more vertical organization can be made.

One direction in which this move should continue to be made is that of weapon system fund control. Plans have already been made to increase the participation by the program manager in program planning, beginning with the budget for fiscal year 1960. Additional means should be developed by which the program manager can plan and control total weapon system funds more effectively.

Other areas in which the program manager should participate to a greater extent include attendance at summary prenegotiation

briefings, as described in Chapter IV, and at additional weapon system program review conferences. Smaller and more frequent program review conferences under the chairmanship of the program manager should be held in order for all cognizant Navy and contractor offices to keep abreast of critical program problems.

Action to implement these recommendations can be initiated by the Systems Director after approval by the Chief of the Bureau and the Assistant Chief, Plans and Programs. Before adoption of these and other measures for greater centralization of program control, however, further study of the nonprocurement considerations, where required, should be undertaken.

2. REQUIRE IBCC CONCURRENT EVALUATION OF FIRM COST ESTIMATES AND TECHNICAL FEASIBILITY OF ENGINEERING CHANGES AS A PREREQUISITE FOR CHANGE APPROVAL

In addition to present efforts to reduce the number of engineering changes, improved means of review of changes are necessary. The IBCC should evaluate technical feasibility and ultimate costs of Class I ECP's concurrently and to an equivalent degree as far as possible. The following specific steps should be taken toward that end:

(1) Issue Instructions to All Aircraft Contractors To Submit Firm Cost Estimates with Their Change Proposals

Contractors should be requested to submit firm cost estimates with their ECP's. A limiting effective date for the cost estimate should be inserted by the contractor within rules to be established by the Director, Contracts Division.

Where detailed factual information is not available from contractors, the estimate should be the best, conservative one possible. In any event, there should be an estimate which is at least as firm and definitive as the technical portion of the ECP.

(2) Decide Feasibility of the Change and Point of Installation on Basis of Technical Advantages and Total Estimated Costs in Relation to Available Program Funds

Value analysis should be employed by the cognizant technical division to equate the total cost of the change proposed to the value of the benefit anticipated as a result of the change. Cost and technical feasibility should be given concurrent, and, to the maximum extent possible, equivalent detailed evaluation. Recommendations as to disposition of the proposed change should be made to the IBCC on the basis of the value analysis results.

(3) Maintain Follow-Up of ECP's at Each Processing Stage

A control desk, preferably the class desk officer, should maintain active follow-up of ECP's at each processing stage to meet the deadline date for validity of contractor's cost estimate and to obviate processing backlogs. Changes should be processed by this date or the proposal should be returned to the contractor for revised estimate.

(4) Enforce the Block System for Incorporating Engineering Changes in Production Aircraft

The block system for installation of changes should be enforced by the Chief, BuAer holding in abeyance noncritical changes on aircraft already produced until the aircraft are returned for periodic overhaul and repair. Anticipated noncritical design changes should be held for incorporation as a block at a point in production which best serves over-all economy, manufacturing schedules and fleet utilization.

In summary, this recommendation provides for evaluation of cost and technical feasibility of engineering change proposals currently, rather than sequentially, and in approximately the same degree of definitiveness.

It is recognized that the solution to the engineering change problem is not a simple one. The problem has plagued the Bureau, and the Air Force as well, for many years. Nevertheless, and particularly in view of current fund limitations, the Chief of the Bureau should designate appropriate officers in research and development, and the other Bureau services concerned, to develop the necessary plans for implementation of improved engineering change control along the general lines suggested.

3. REVISE PROCEDURES AND STAFFING REQUIREMENTS IN BAR OFFICES TO PROVIDE SURVEILLANCE OF CONTRACTOR POLICIES AND PROCEDURES RATHER THAN DETAILED VERIFICATION OF ROUTINE DOCUMENTS

Two basic changes in present practice are paramount. First, in lieu of the present requirement for verification of all engineering drawings prepared by the contractor, it is recommended that the BAR Engineering Division concentrate its efforts on evaluation of the contractor's engineering controls and procedures, with spot checks of compliance of drawings with specifications. Producibility, maintenance, and material utilization should be stressed. To this end, inspection policies and procedures of the Department of the Navy should be reviewed by the Office of Naval Material and new guidelines furnished to BuAer.

Second, as in the case of engineering drawings, a more basic and selective review of procurement documents should be required of

BAR staffs. Emphasis should be placed on verification of the adequacy of the contractor's procurement policies and procedures rather than on review of all subcontracts and purchase orders. Spot check reviews should be made of procurement documents, with emphasis on: (1) capability of the proposed subcontractor or vendor to deliver on schedule the quality and quantity specified, and (2) large dollar purchases. Attention to subcontractor capability will be particularly important as more weapon system responsibility is assigned to prime contractors.

This shift in method of procurement review will require fewer clerical and general administrative personnel and more professional engineers in BAR offices. Plans should be made by the Assistant Chief for Procurement, therefore, to revise job descriptions to include an adequate number of qualified engineers in each BAR as aircraft contractors are assigned more weapon system responsibility.

Development of instructions to implement the details of this recommendation should be the responsibility of a project team composed of BAR and BuAer personnel, representing Contracts, Quality Control and Engineering Divisions. These instructions should be issued by the Chief of the Bureau.

4. ASSIGN TO BAR CONTRACTING OFFICERS AUTHORITY TO FINALIZE THEIR NEGOTIATIONS

At present, some BAR contracting officers have authority to negotiate contract change orders up to $300,000 but are required to forward a summary of such negotiations to the Bureau for finalization.

It is recommended that BAR contracting officers be authorized to finalize, in prescribed contractual form, all negotiations for which they have authority to conduct. This authority will expedite formal approval to the contractor and thus permit more prompt production go-ahead.

For purposes of fiscal control, cognizant divisions of the Bureau should receive prompt notification of amounts obligated by BAR's at the time of negotiation of these changes.

Action should be initiated by the Director, Contracts Division after approval by the Chief of the Bureau.

5. EXPAND CAREER DEVELOPMENT AND TRAINING PROGRAM FOR CONTRACTING PERSONNEL IN BUAER AND BAR OFFICES

Previous chapters in this report have pointed out the need for increased training of negotiators, procurement analysts and procurement specialists. Efforts by the Contracts Division to increase the training of these personnel should be continued at a pace commensurate

with the turnover of personnel and the rate of change in procurement regulations and procedures.

In addition to this effort, increased attention should be given within the Bureau to an expanded, more comprehensive career development and training program for all key contracting personnel. For career military personnel such a program would encompass rotation between the Bureau and BAR offices. Assignments to key positions in BAR offices should be preceded by either a full tour or a "refresher" tour in the Bureau. This total rotation plan should be integrated with tours at business schools or other training courses in business management, including contract administration.

Civilian contract officers in BAR offices, in addition to being included in Navy and Air Force courses, periodically should be brought into the Bureau for refresher purposes on a temporary duty basis. These and other steps for career development of Bureau civilian personnel are already under way. Maximum support and attention to such programs is important to their success and should be given.

The details of the means for accomplishment of a more comprehensive rotation and training program are beyond the scope of this study. The purpose of this recommendation is to stress the need for increased emphasis on a career development and training program for both civilian and officer personnel who have contracting functions to

perform. Approval of the Bureau of Naval Personnel and the Executive Office of the Secretary may be required for a comprehensive and coordinated total program.

6. MAINTAIN CLOSER CONTROL AND FOLLOW-UP OF PROCUREMENT DOCUMENT PROCESSING

In addition to present efforts by division directors and the Office Services Division to control document flow within the Bureau, the following should be accomplished.

(1) Provide More Selective Routing of Procurement Documents on Basis of Content

All division directors should review the basis for routing procurement documents (procurement requests, amendments and contract drafts) to be assured that such routing is consistent with the need to know and approve.

Documents should not receive a general routing; emphasis should be on selectivity based on dollar amount, technical complexity, and significant contribution by the person to whom the document is routed for action.

(2) Maintain Central Control and Follow-Up Action on Change Notices and Engineering Change Proposals

In addition to its present function of controlling contracts, amendments, alphabetical change orders and delivery changes,

the Office Services Division should maintain a Bureau record of total processing of change notices and engineering change proposals. These additional records will make this Division a central control point for all major contract documents.

To this end, the Office Services Division should establish control forms and procedures as necessary for integration with the functions of the Intra-Bureau Change Committee and the class desk officer or other central office having responsibility for central approval of requests for ECP's. In this connection, the Office Services Division should be considered as a clerical adjunct to these offices. It should maintain necessary records and prepare follow-up notices in accordance with standards of processing time to be established by the Director, Contracts Division.

(3) Submit Reports of Total Procurement Document Flow to a Central, Authoritative Control Office in BuAer for Review and Initiation of Corrective Action

In addition to the individual follow-up notices now submitted by the Office Services Division to the division director responsible, a summary analysis of total procurement processing time should be submitted to the Director, Contracts Division for review and recommendation of corrective action where necessary. Recommended

action should be reported to the Assistant Chief for Procurement for implementation.

An information copy should be submitted to the Systems Director for use by the program manager having cognizance over an individual program. In this manner, the program manager can be informed in a timely manner of significant problem areas.

Many of the steps required to effect these recommendations are within the jurisdiction of the Office Services Division and the Contracts Division. However, the problems of delays in document processing have been of sufficient magnitude that the attention of the Chief of the Bureau is suggested.

7. PERIODICALLY REVIEW CONTRACT COST REPORTS TO ASSURE HIGHLIGHTING OF POTENTIAL COST OVERRUNS AND INTEGRATION WITH TOTAL BUAER REPORTING REQUIREMENTS

The newly-established "Financial Status Report of Contract" (DD Form 1097) report should be reviewed periodically by a BuAer-industry project group to determine whether the information required is integrated effectively with total Bureau requirements for data from contractors. Further, in the analysis of this report, the program managers should compare planned expenditures with contractor forecasts at each major check point in the program (e. g., start of static

test, release of basic engineering to new first flight schedule, first flight, start of BIS, and FIP). This check should readily identify coming out-of-line costs compared to program plans and should aid in spotting potential cost overruns before they become too large.

In addition, preliminary efforts now being made by the Systems Director to obtain quarterly cost forecasts should be continued on an expanded basis to include all major Navy aircraft and missile contractors. To the extent required by Air Force or Army contracts with the contractor, requests for progress data should be coordinated with these services.

* * * *

The last chapter of this report presents recommendations concerning areas for further study which are beyond the scope of this survey but which have been found to be worthy of attention by the Chief of the Bureau of Aeronautics.

VI. AREAS FOR FURTHER STUDY

VI. AREAS FOR FURTHER STUDY

The foregoing chapters have dealt principally with the elements of the contracting function. Chief items of interest among these included contract types, pricing, incentives, negotiations and the weapon system concept. Directly or indirectly these bear importantly on the over-all success of a procurement program.

As this study progressed, it became evident that other factors in noncontractual areas also had a direct bearing on the success of aircraft procurement. For example, the fluctuation of industrial activity, over the long range, tends to cause competent engineers and managers to migrate to more stable employment. Industrial instability leads to high cost and low quality. The effects of these may be much more profound and far reaching than the use of a specific contract type or a contract administration procedure.

It has been appropriate and beneficial to examine the process of contracting for aircraft. It is also eminently necessary that the total procurement problem be recognized and that each of its elements be put into proper perspective and context.

It has not been possible in this assignment to isolate and evaluate all of the related aircraft procurement problems, or even all of the important ones. Undoubtedly, such an analysis of at least the more important related problems would be helpful to the Navy and should be undertaken at the proper time. Certain items of clear significance have been pointed up by this contracting study. These are presented in the following paragraphs as suggestions for possible further study at some appropriate time.

1. REVIEW THE TOTAL BUAER ORGANIZATION FROM THE STANDPOINT OF THE BALANCE THAT EXISTS, AND THAT WHICH SHOULD EXIST BETWEEN ITS TECHNICAL AND PROCUREMENT FUNCTION

A study should be made of the present BuAer organization to assure that a proper balance exists between its two principal functions: specification of what is to be bought, and the buying of it.

Chapter V has already pointed out certain organizational needs for greater centralization of program decision-making and control. This need is expressed within the present study from a purely contracting point of view. It needs to be studied and appraised from a total, Bureau-wide point of view. In fact, considering the full impact of the weapon system concept, and further considering the influences of ONM and other agencies outside BuAer, the organization of the Bureau of Aeronautics should be re-evaluated and appraised in perspective with the total Department of the Navy.

Successful functioning of the Bureau requires that the contracting function receive appropriate Navy management attention, support and supervision. It also requires that the function operate coequally and cooperatively with the Research and Development and Field Activities Divisions. The suggested study should assure that effective working relationships and procedures are used between divisions, and between BuAer and other agencies. It should provide the decision-making capability as close to the scene of operation as feasible.

The over-all objective of this suggested study should be to increase the effectiveness of operations, simplification of procedures and improvement of direct working relationships. It should accomplish a significant improvement in coordination and direction of operations, and should assure placing the most competent people in jobs of proper grade and description under the necessary direct supervision.

This area represents the greatest need for further study and offers the greatest opportunities for benefits.

2. CONTINUE THE INVESTIGATION STARTED BY BUAER'S AIRCRAFT DIVISION TO ESTABLISH CONTROLS OVER ENGINEERING CHANGES

Following the lead established by the Aircraft Division, BuAer should expand its study into the causes and control of engineering changes. The work done to date has already made more than a 50%

improvement in the volume of pending changes in the research and development group. More work remains to be done.

Changes are a major factor in the increased cost and delay of aircraft programs. They increase the workload on the Contracts Division by a large amount and are a principal contributor to the delay in processing contractual documents. They are frequently a cause, too, of argument and disagreement between BuAer and contractors.

The object of the suggested study should be to preserve the engineering change procedure for necessary changes but to reduce the number, complexity and costliness of changes that are being permitted to be initiated on all programs. Also, further detailed study is needed to implement the recommendations in Chapter V regarding more timely and weighty consideration of the costs of changes.

3. STUDY PROCUREMENT OF GUIDED MISSILES TO DEVELOP SPECIFICALLY SUITABLE CONTRACT TYPES AND CONTRACTING METHODS

The Sparrow III case study performed during this assignment showed that contracting methods that have been applied to aircraft procurement are probably not completely applicable for missiles procurement.

Fundamentally, missiles of the category of the Sparrow III are vastly different from aircraft such as the P6M, F8U or A4D. Competitive

factors, engineering approach and manufacturing methods are distinctive and require different treatment. The procurement process and, particularly, the contracting function should be treated differently.

It is recognized that missile procurement was entered into on the basis of the best methods and judgment available at the time the missile programs were begun. The time appears proper now, however, to make a more thorough investigation of all of the factors surrounding missile procurement. Out of such a study should be developed the contract types, timing, applicable incentives, cost and pricing principles and the other factors that would assure most economical and beneficial total procurement.

4. STUDY DESIGN COMPETITION AND CONTRACTOR SELECTION PROCESS TO DEVELOP THE MEANS TO ASSURE THE BEST END-PRODUCT AT THE MOST REASONABLE COST

Contractor selection has been a primary matter of consideration for both BuAer and the Air Force for some time. The need has been to preserve industrial competition, achieve the objectives of time, cost and end-product performance, advance the state of the art and deal with all the pressures that surround the procurement process. Obviously, there is no easy or simple answer to these conflicting interests. The impact of the weapon system concept further increases the problems of contractor selection.

Although it is apparent that there is no one best solution to the problem, it is also evident that an improved system of selection is desirable to both BuAer and the Air Force.

BuAer's practice generally is to give every interested aircraft contractor an opportunity to compete for a new aircraft development program. Considering the number of participants in a design competition, and the cost of developing the design proposals, plus the Navy's own costs in evaluating these proposals, the present contractor selection process may cost the Navy more than $5 million in a single program. There is no conclusive evidence that the Navy's design competition is any more equitable to contractors or any more effective in getting the best ultimate design than the Air Force's contractor selection system. Moreover, the money spent for the competition may well be better invested in developing the design further.

An investigation of the total situation surrounding contractor selection should be undertaken. Due consideration should be given to the desirability of preserving competition and the needs to get the best aircraft quickly. Attention should also be directed to the need for greater stabilization of the workload in contractors' plants and to the conflict of that concept with the need for preserving some degree of competition.

5. ESTABLISH CRITERIA BY WHICH TO MEASURE TOTAL CONTRACTOR PERFORMANCE

A major void in the total procurement process is the absence of valid, consistent, accepted criteria by which total contractor performance can be assessed, and by which the over-all success of an aircraft program can be judged. Some aspects of contractor performance are crucial in applying performance guarantees, correction of defects and "best efforts" clauses, profit and final price determinations and renegotiation settlements. This lack is basic to the confusion, disagreements and conflicts that frequently occur in BuAer-contractor relationships.

It is recognized that both the Navy and industry have tried to establish such criteria in the past. The requirement for higher performance products, the need to assure high quality contractor performance and the importance of receiving the most defense per dollar spent gives new emphasis to the need to establish such criteria. These criteria, if successfully developed, could provide an important guide to future contractor selection as well.

The foregoing list of additional areas in which study and investigation could be profitably done is by no means complete. It is intended only to point out some of the more immediate and more important needs. Some other less significant, but noteworthy, needs for further study are:

(1) Study of procurement of and contracting for aircraft components not covered by prime weapon system contracts.

(2) Review of facilities contracting and its relation to aircraft procurement.

(3) Spares and maintenance contracting--optimum forms and methods and the tie-in with aircraft contracts.

(4) Further study of the submission of all types of contractor reports and their use by various segments of the Department of the Navy.

Aircraft procurement is a dynamic process. Its progress causes new problems to emerge. Continual study and continuous alertness to the need for change and improvement is the rule for all who engage in the process of aircraft procurement.

It is important, therefore, that the additional studies proposed here be used to enlarge the wisdom and business judgment of those who guide the procurement process. Any inclination to reduce the process or the function of contracting to inflexible rules, to be applied indiscriminately to every procurement situation, clearly should be avoided.