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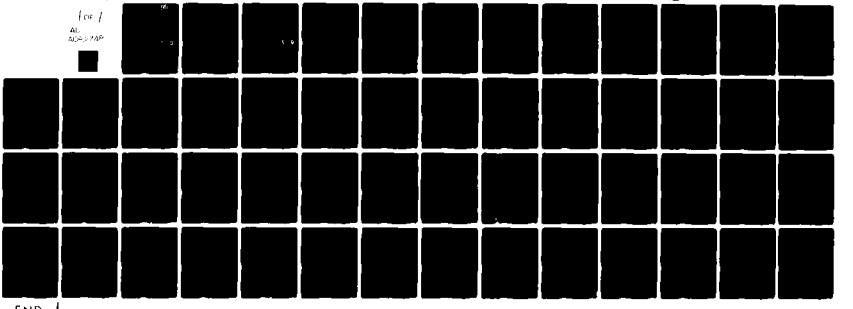

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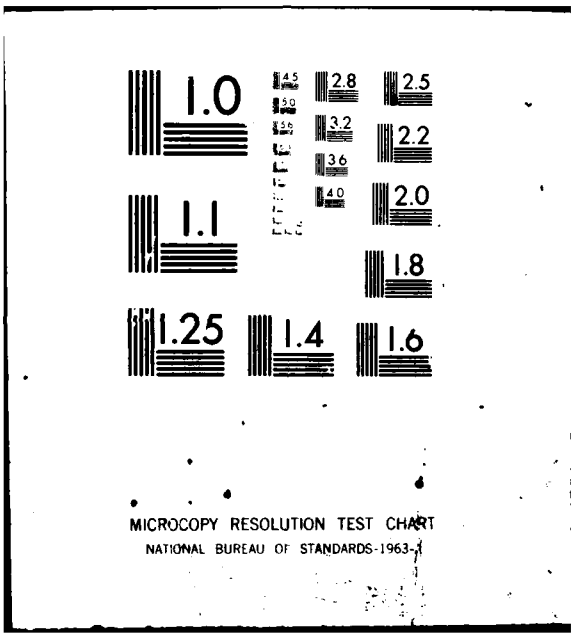
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CONTRACTING FOR SOFTWARE ACQUISITION
One of the Software Acquisition Engineering Guidebook Series

DIRECTORATE OF EQUIPMENT ENGINEERING
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TECHNICAL REPORT ASD-TR-78-50
Final Report

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AERONAUTICAL SYSTEMS DIVISION
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This report is one of a series of guidebooks whose purpose is to assist Air Force Program Office Personnel and other USAF acquisition engineers in the acquisition engineering of software for Automatic Test Equipment and Training Simulators. This guidebook describes the contract acquisition process, including requests for proposal and source selection. It describes types of contracts applicable to Automatic Test Equipment and Training Simulator software.

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FOREWORD

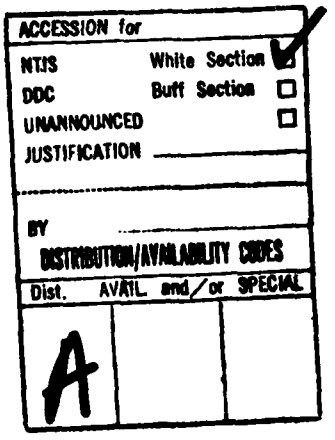
This guidebook was prepared as part of the Software Acquisition Engineering Guidebooks contract, F33657-76-C-0723. It describes the contract acquisition process, including requests for proposal, source selection and acquisition management. Responsibilities of the software acquisition engineer and proposing contractors are identified. The ground systems under specific consideration are training simulators and automatic test equipment.

This guidebook is one of a series intended to assist the Air Force Program Office and engineering personnel in software acquisition engineering for automatic test equipment and training simulators. Titles of other guidebooks in the series are listed in the introduction. These guidebooks will be revised periodically to reflect changes in software acquisition policies and feedback from users.

This guidebook reflects an interpretation of DOD directives, regulations and specifications which were current at the time of guidebook authorship. Since subsequent changes to the command media may invalidate such interpretations the reader should also consult applicable government documents representing authorized software acquisition engineering processes.

This guidebook contains alternative recommendations concerning methods for cost-effective software acquisition. The intent is that the reader determine the degree of applicability of any alternative based on specific requirements of the software acquisition with which he is concerned. Hence the guidebook should only be implemented as advisory rather than as mandatory or directive in nature.

This guidebook was prepared by the Boeing Aerospace Company.



This Software Acquisition Engineering Guidebook is one of a series prepared for Aeronautical Systems Division, Air Force Systems Command, Wright-Patterson AFB OH 45433. Inquiries regarding guidebook content should be sent to ASD/ENE, Wright-Patterson AFB OH 45433. The following list presents the technical report numbers and titles of the entire Software Acquisition Engineering Guidebook Series. Additional copies of this guidebook or any other in the series may be ordered from the Defense Documentation Center, Cameron Station, Alexandria VA 22314.

ASD-TR-78-43,	Computer Program Maintenance
ASD-TR-78-44,	Software Cost Measuring and Reporting
ASD-TR-78-45,	Requirements Specification
ASD-TR-78-46,	Computer Program Documentation Requirements
ASD-TR-78-47,	Software Quality Assurance
ASD-TR-78-48,	Software Configuration Management
ASD-TR-78-49,	Measuring and Reporting Software Status
ASD-TR-78-50,	Contracting for Software Acquisition
ASD-TR-79-5042,	Statements of Work (SOW) and Requests for Proposal (RFP)
ASD-TR-79-5043,	Reviews and Audits
ASD-TR-79-5044,	Verification, Validation and Certification
ASD-TR-79-5045,	Microprocessors and Firmware
ASD-TR-79-5046,	Software Development and Maintenance Facilities
ASD-TR-79-5047,	Software Systems Engineering
ASD-TR-79-5048,	Software Engineering (SAE) Guidebooks Application and Use

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Section 1.0 INTRODUCTION

Contracting is the formalized method of procuring an identified product under specified conditions. The process of consummating and managing ground system software procurement involves specifying complex software and hardware/software interfaces, evaluating competing companies and their proposed systems and managing technical requirements, schedules, and costs. This guidebook discusses these processes from early planning through contract fulfillment, as these processes specifically apply to software for Training Simulators (TS) and Automatic Test Equipment (ATE).

1.1 PURPOSE

It is the purpose of this guidebook to assist USAF procurement engineering personnel in the acquisition of Training Simulators and Automatic Test Equipment and to ensure uniform application of regulations and other sound procurement practices. The guidebook is also intended to be helpful to Air Force managers responsible for the procurement of total TS or ATE systems. References to appropriate DOD, Air Force, and MIL-STD documents are provided to allow further detailed investigation into areas of specific interest.

1.2 SCOPE

This is one of a series of guidebooks related to the Software Acquisition Engineering (SAE) process for TS and ATE ground based systems. The SAE guidebook titles are listed below:

- Software Cost Measuring and Reporting
- Requirements Specification
- Contracting for Software Acquisition
- Statements of Work (SOW) and Requests for Proposal (RFP)
- Regulations, Specification and Standards
- Measuring and Reporting Software Status
- Computer Program Documentation Requirements
- Software Quality Assurance
- Verification
- Validation and Certification
- Computer Program Maintenance
- Configuration Management
- Reviews and Audits
- Management Reporting by the Software Director

For the purposes of this guidebook, Contracting for Software Acquisition encompasses solicitation documents; proposal evaluation; contractor selection; contract change management; and contract compliance. The emphasis is on specific contracting considerations, whereas detailed treatment of related topics (e.g., requirement specification, RFP, SOW, etc.) is referenced to other guidebooks in this series. Items that are unique to either TS or to ATE are specifically addressed in each document section.

1.3 TS AND ATE OVERVIEW

1.3.1 TS System Characteristics

The TS system is a combination of specialized hardware, computing equipment, and software designed to provide a synthetic flight and/or tactics environment in which aircrews learn, develop and improve the skills associated with individual and coordinated tasks in specific mission situations. Visual, aural, and/or motion systems may be included. Figure 1.3-1 depicts a typical training simulator which employs digital processing capability.

The computer system, integral to crew training simulator, can consist of one or more general purpose computers. The computing hardware operates with floating point arithmetic and sufficient bit capacity to provide efficient use of a simulator High Order Language (HOL).

When a multi-processor/multi-computer system is used, it must be designed such

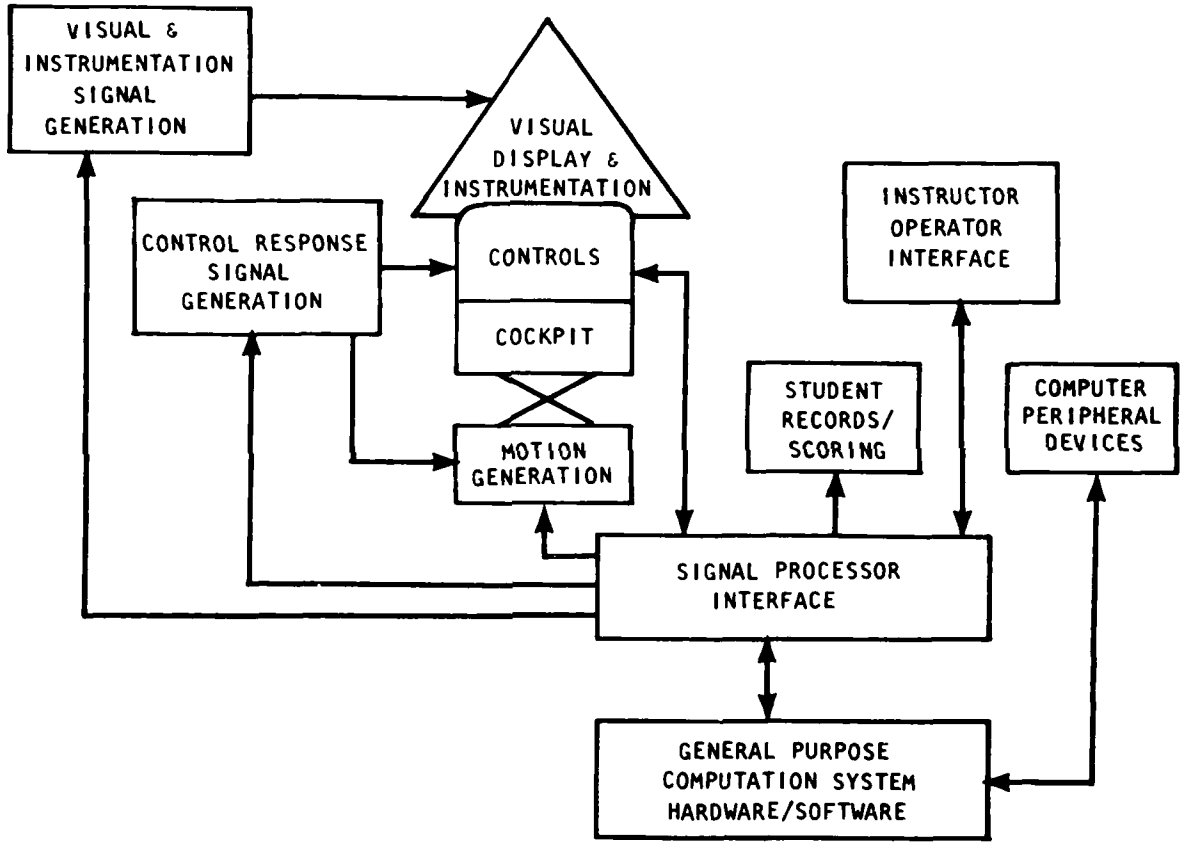


Figure 1.3-1. Typical Crew Training Simulator

that computers can operate simultaneously and are controlled/synchronized by a single program (supervisor/ executive). The executive directs program execution and regulates priorities.

The simulator (1) accepts control inputs from the trainee (via crew station controls) or from the instructor operator station; (2) performs a real-time solution of the simulator mathematical model; and (3) provides output responses necessary to accurately represent the static and dynamic behavior of the real world system (within specified tolerance and performance criteria).

Since training simulators consist of interdependent hardware and software, a joint hardware/software development effort is required. As the complexity of training simulators increases, simulation software continues to grow in complexity, size, and cost. Software costs can and do exceed computer hardware costs in many cases. Therefore, it is imperative that the simulation software acquisition engineering process be subjected to formal system engineering planning and discipline to ensure cost-effective procurement.

1.3.2 ATE System Characteristics

Automatic Test Equipment is defined as that ground support system which performs vigorous system tests with minimum manual intervention. ATE is used in place of manual devices because it is more cost effective, provides required repeatability, or repair of the item being tested requires the speed which only an automatic tester can achieve.

Figure 1.3-2 shows the typical components of an ATE system. Note that there are both hardware and software elements involved. Most of the elements shown in the figure will be found in the majority of ATE systems although the packaging and interface design may vary between specific systems.

The controls and displays section consists of the computer peripheral devices such as control panels, magnetic tape cassettes or disks, a cathode ray tube (CRT), keyboard, and small printer. The computer (normally a minicomputer), as controlled by software, operates the peripheral devices; switches test stimuli on and off; and measures responses of the Unit Under Test (UUT) (comparing to predetermined values). The operator maintains supervisory control of the testing process through the peripherals; however, his interaction is usually minimal since, by definition, the automatic test feature was selected in preference to an operator-controlled test system.

ATE is normally designed to accommodate testing several different articles of system equipment (normally one at a time). The maintenance level being supported by the ATE is determined by logistics systems analysis.

The importance of the software portion of the ATE system should not be minimized since both the application of the test stimuli and the measurement of the result are achieved via software. Arbitrary function generation and complicated wave analysis can also be accomplished by software and is becoming more prevalent in ATE systems. The cost of ATE software is a significant component of total ATE costs and design trades can be performed to minimize ATE life cycle costs.

1.4 GUIDEBOOK ORGANIZATION

Section 1.0 of this guidebook contains introductory material about the guidebook, including guidebook purpose and scope, and the guidebook's relationship to the other SAE guidebooks. It provides a brief description of typical ATE and TS systems and describes the organization and use of the guidebook.

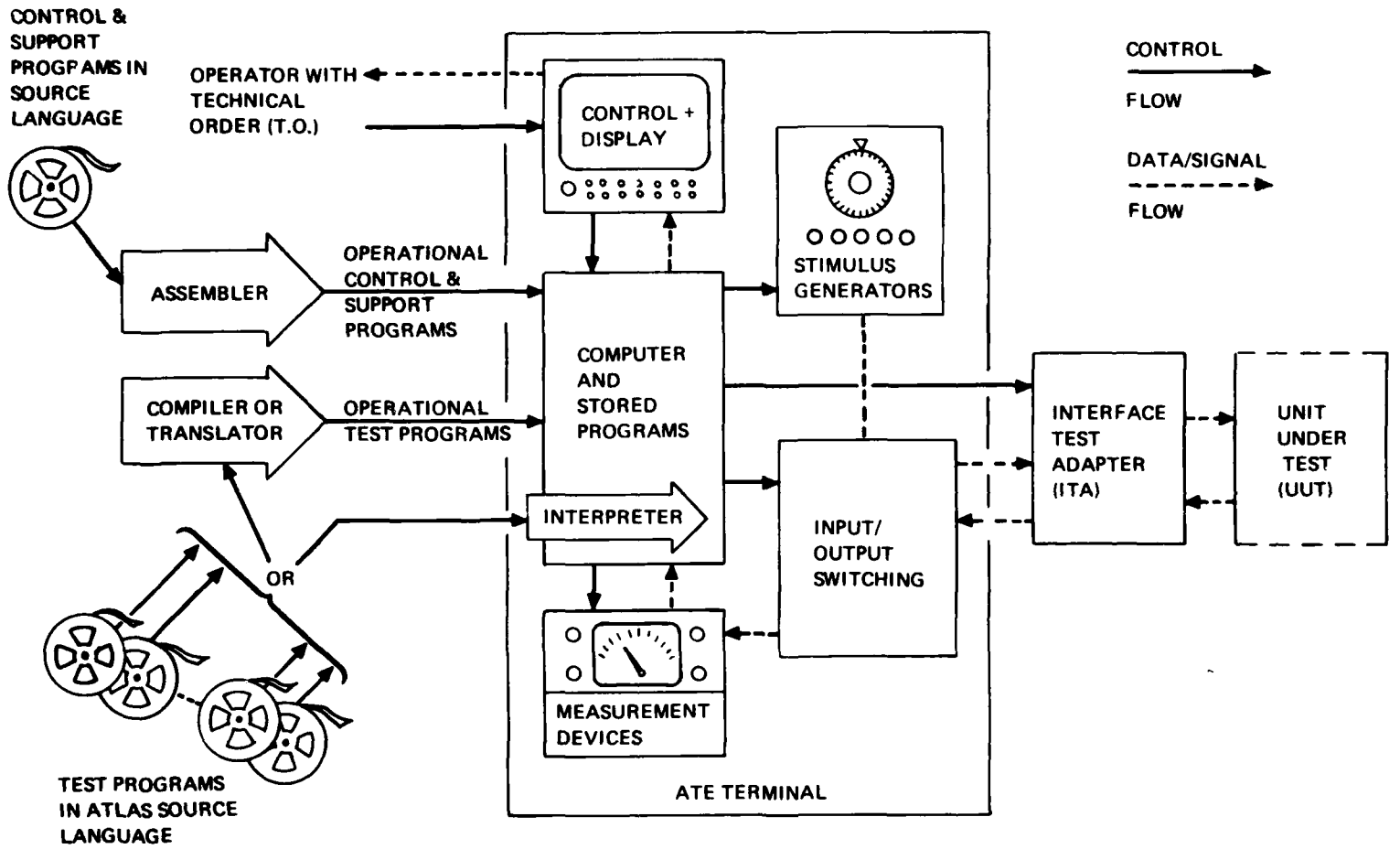


Figure 1.3-2. Typical ATE Configuration

Section 2.0 is a list of key government documents that were referenced in the preparation of this guidebook.

Sections 3 through 6 contain ground systems software contracting guidelines. Section 3.0 provides an overall software contract perspective including factors and trades that should be considered while still in the pre-contract phase. This section is an introduction to contracting for ground system software and contains discussions specific to TS and ATE. Section 4.0 addresses the formal steps involving the source selection authority, and his supporting staff, source lists, preparation of advanced information, and solicitation documents. It also discusses appropriate regulations such as AFR70-15. Section 5.0 discusses the process of source selection and it includes provision of appropriate TS and ATE software support to contractor selection. Section 6.0 covers those areas pertinent to post contract award including contract management, changes to contracts, and contract compliance.

Section 7.0 is a bibliography of documents that are generally applicable to the subject of software contracting. This section is an expansion of Section 2.0, referenced documentation. The section includes documents not specifically noted in the text. Section 8.0 provides a matrix tabulation for the cross reference relationship between guidebook topics and corresponding government documents. Sections 9.0 and 10.0 contain respectively a glossary of selected terms used in the guidebook, and the expansion of all abbreviations and acronyms used in the guidebook. Section 11.0 is a detailed subject index indicating which guidebook paragraphs address the listed subjects.

Section 2.0 APPLICABLE DOCUMENTS

This section lists documents which bear on the subject of contracting for software acquisition. A contents summary of principal documents is included in Section 7.0.

AFR 70-15, Source Selection Procedures

AFSC Supl., AFR 70-15, Source Selection Policy and Procedures

ASD Supl., AFR 70-15, Source Selection Procedures

AFR 800-12, Acquisition of Support Equipment

AFR 300-2, Management of the USAF Automatic Data Processing Program

AFR 800-2, Acquisition Program Management

Armed Services Procurement Regulations (ASPR), Several of these are applicable and specific references are provided in the text.

AFR 310-1, Management of Contractor Data

DOD 5000.19-L, Acquisition Management Systems and Data Requirements Control List

AFR 800-14, Management of Computer Resources in Systems

AFR 800-6, Program Control-Financial

Section 3.0 SOFTWARE ACQUISITION

This section summarizes contracting principals associated with ATE and TS. Particular emphasis is given to the requirement of Armed Services Procurement Regulations (ASPR) as these apply to the acquisition engineering role. The formal source selection process is introduced along with particular requirements of AFR70-15 and its supplements. These guidelines are applicable to ATE and TS hardware as well as software since software is normally acquired as an integral part of the ATE or TS system. In addition, guidelines are provided with emphasis on those matters applicable to software acquisition for ATE and TS.

3.1 ATE & TS SOFTWARE CONTRACTING

Contracting for ATE and TS software acquisition involves conformance with a number of DOD, Air Force and Air Force Systems Command regulations and other forms of command media.

3.1.1 General Requirements

AFR 70-15 establishes policy and procedures associated with formal source selection. It defines the source selection organization, responsibilities and activities required to plan and conduct source selection activities. It is consistant with the ASPR which establish fundamental authority for all procurement activities of the military establishment.

AFR 70-15 is applicable to major systems, those requiring at least $50M Research Development Test & Evaluation (RDT&E) funds or projected production funds of $200M or more. While few ATE and TS programs normally require funding at these levels, AFR 70-15, together with its AFSC and ASD supplements, recommend application of its general principals to smaller procurements. This process is discussed in greater detail in later paragraphs.

3.1.2 Types of Contracting

ASPR 2-102, 2-501, and 3-200 recognize three primary types of procurement.

3.1.2.1 Procurement by Formal Advertising. Procurement by formal advertising (ASPR 2-102) involves preparation of detailed specifications by the Government and making these specifications available to a preselected list of responsible contractors. Each contractor then proposes a price in accordance with the specifications. Since the government's specifications are complete, a technical proposal from the bidders is not necessary. Award is made to the responsible bidder whose offer is most advantageous to the government. While price is the fundamental factor governing award, other factors may be considered.

The contracts resulting from procurement by formal advertising are of the firm fixed price type, with or without price adjustments based on changing economic factors. In such contracts the financial liability to the government is limited by the firm fixed price as adjusted by economic factor. The contractor bears the fundamental cost risk and his profitability is determined by cost performance. This method of contracting places the greatest emphasis on the profit motive. This motive is the fundamental influence on american industry.

Because of the advantages to the government and the freedom on the part of contractors to strive for cost control as a means of maximizing profits, ASPR 2-102.1 requires this method to be used whenever such method is feasible and practical.

It is fundamental to this procurement concept that the system being procured can be described via the procurement specification, in such a way that the government is assured of meeting its total requirements, no matter which of

several competing contractors is selected. Further, the specifications cannot in any way favor any particular contractor's proprietary products, approaches or manufacturing processes. Hence, the risk associated with technical or performance integrity lies primarily with the government. For this reason fixed price contracting is rarely advantageous to the government where factors exist which preclude such specification.

The nature of TS and ATE is such that as a matter of practicality procurement by formal advertising is rarely used. Training simulators procured by the USAF often involves advanced technology requirements. The contractor often must design new hardware and software. Hence, a form of contracting which places a degree of burden on the contractor to ensure technical performance of his system is more advantageous to the government. The acquisition engineer with his knowledge of the technical requirements of the ROC or other originating material and the "state of the art" of TS is in the best position to assist in determination of this fact.

Similarly, ATE has not yet matured to the point at which Procurment by Formal Advertising is practicable. Unique adapters, UUT test software, environmental considerations and other particulars affecting control software exist in the majority of USAF applications. However, as these systems mature and become more standardized, the time may come when USAF requirements can best be met by procuring "off the shelf" ATE. This may very well change the method of contracting. The acquisition engineer is in the best position to know whether this point has been reached in any particular application and thus provide expert opinion during the procurement planning phase.

3.1.2.2 Two Step Formal Advertising. ASPR 2-501 describes a modification of the method described above which may make the method more nearly applicable to TS and ATE procurement. Called Two Step Formal Advertising, this method expands the use and obtains the benefits of formal advertising, where inadequate specification preclude the use of conventional formal advertising. It is particularly useful in procurement requiring technical proposals for complex equipment. It is conducted in two steps.

Step one consists of the request for, and submission evaluation of, technical proposals with pricing. In step one, conformity with the government's technical requirements is resolved. During this phase contractors whose technical submittals are unacceptable, and cannot be made acceptable without undue effort both on the part of the government and the contractor, can be eliminated.

Step two is then a formal advertised procurement which is confined to those contractors who submitted acceptable technical proposals during step one.

Two Step Formal Advertising Procurements result in firm fixed price contracts with or without economic price adjustment. This method combines the advantage of maximizing the profit incentive with the advantage of sharing the risk of technical integrity between the government and the contractor. ASPR 2-502 lists the conditions for use of this method of procurement. In general, these conditions state that available government specifications are not sufficiently definitive or complete, that definite criteria exists for evaluating technical proposals, that more than one technically qualified source is expected to be available and that sufficient time is available for use of the two step method.

The acquisition engineer becomes more deeply involved during the procurement phase with Two Step than with Formal Advertising procurements. In the later case his principle involvement is in preparation of the technical specifications which accompany the solicitation

documentation. Guidelines appropriate to this activity are included in paragraph 4.2.

In the Two Step process the acquisition engineer is also involved in evaluation of each contractor's technical and management proposals. This evaluation is described in paragraphs 5.2 and 5.3.

3.1.2.3 Negotiated Procurements. The majority of ATE and TS procurements are performed under the authority of 19 U.S.C. 2304(a) and described in Section III of the ASPR pertaining to Negotiated Procurements. Because of the technical and cost risk associated with ATE and TS procurements involving new developmental hardware and/or software, it is impractical to attempt procurement by the methods described in paragraphs 3.1.2.1 and 3.1.2.2, above. In addition, ATE and TS are often acquired as an integral part of a larger weapon system and are procured by the same acquisition method as the larger system. Virtually all weapon systems acquisitions are negotiated procurements.

This method differs from formal advertising in that a Request for Proposal (RFP), containing the governments technical requirements, are made available to industry. Contractors then respond with technical, management and cost proposals. Those which are not sufficiently responsive are eliminated and contracts are then definitized with the remaining contractors. Final prices associated with these contracts are negotiated with each responsive and responsible contractor. This negotiation may also involve modification of the contractor's technical or management proposals. After all negotiations are completed, an award is made to the firm or firms whose negotiated technical, management and cost proposals are most advantageous to the government.

ASPR 3-200 defines the circumstances under which negotiated procurement may be substituted for formal advertising or two step procurements. Of these, the following are applicable in the case of ATE, TS and other ground systems.

a. ASPR 3-204 constitutes authority for application of negotiated contracts to personal or professional services contracts. Such contracts may be appropriate to vendor supplied software support services provided at government facilities. This may be required to maintain software for previously delivered ATE and TS and to provide assistance in the development of organic software maintenance capability.

b. ASPR 3-211 permits application of negotiated contracts to experimental, developmental or research work. This may be applicable where the ATE or TS requires the practical application of investigative findings and theories of a scientific nature. Such would be the case where the software is both unique and of a scientifically complex nature. This category fits a wide variety of TS software and algorithms. It should be noted, however, that the authority established by ASPR 3-211 does not apply to negotiation of contracts involving quantity production. Hence, while it may be applicable to prototype development of ATE and TS, particularly the software, it would not normally apply to quantity production versions of these systems.

c. ASPR 3-212 establishes the authority for procurement by negotiation where the ATE or TS is classified "confidential" or higher and this classification would preclude release to the public of the necessary solicitation documents.

d. ASPR 3-214 provides the authority which is applicable to most aerospace systems where negotiated procurement is authorized. It indicates negotiated procurement is authorized. It indicates negotiated procurements may be used where it is determined that the system requires substantial initial investment or an extended period of preparation for manufacture. This is certainly applicable to ATE or TS systems normally procured by the USAF. ASPR 3-214 further

indicates its authority may be used for the procurement of "technical or specialized supplies--for example: aircraft, tanks, radar, guided missiles, rockets, and similar items of equipment; major components of any of the foregoing; and any supplies of a technical or specialized nature which may be necessary for the use or operation of any of the foregoing." The majority of ATE and TS procured by the USAF fits this category.

e. ASPR 3-215 permits negotiation where previous attempts to procure the system by formal advertising have failed because only unreasonable bids were received.

(1) Industry normally objects to the firm fixed price contracts resulting from advertised procurements where the system involves new or modified hardware or software. Because most USAF procurements, ATE and TS included, are highly competitive it is difficult for the contractor to add significant markup, or gross profit, to his estimated costs and still produce a competitive price. Yet, this markup is the contractor's only contingency to offset unexpected costs which nearly always arise during the development of hardware and software. It may therefore be frequently impractical to attract responsible bidders for complex ATE and TS if the firm fixed price contract is to be used. This will then preclude advertised procurements and the authority provided by ASPR 3-215 may therefore apply.

(2) ASPR 3-402 recognizes a number of contract types which may be used with negotiated procurements. Those which are normally used for ATE and TS negotiated procurements are summarized here. While the final decision of which type of contract to be used rarely is made by the acquisition engineer, nevertheless his recommendations in this regard, are of significant importance. The determination of contract type is largely based on the technical content of the ATE or TS system to be acquired. The acquisition engineer's information is fundamental to this process. Secondly, the type of contracting method is of extreme significance in the number and quality of contractors attracted by the procurement. This in turn affects the amount of post award government effort required to properly manage the contractor. Hence, it is particularly important that the acquisition engineer influence this selection process.

(a) Cost-Reimbursement Type Contracts (ASPR 3-405)

The cost-reimbursement type of contract provides for payment to the contractor of allowable costs incurred in the performance of the contract to the extent prescribed in the contract. This type of contract establishes an estimate of total cost for the purpose of (1) obligation of funds, and (2) establishing a ceiling which the contractor may not exceed (except at his own risk) without prior approval and subsequent ratification by the contracting officer.

The cost-reimbursement type contract is suitable for use only when the uncertainties involved in contract performance are of such magnitude that cost of performance cannot be estimated with sufficient reasonableness to permit use of any type of fixed-price contract. In addition, it is essential that (1) the contractor's cost accounting system is adequate for the determination of costs applicable to the contract and (2) appriate surveillance by government personnel during performance will give reasonable assurance that inefficient or wasteful methods are not being used.

Major weapon systems are normally procured by this method. Supplemental agreements to the prime weapon or aircraft system contract for the provision of ATE or TS are therefore of this type. In addition this type is useful where advanced technology hardware of software requirements exist for TS and ATE regardless of whether they are procured as an integral part of a larger system or procured on a stand alone basis.

(b) Cost-Plus-Award-Fee (CPAF) Contract (ASPR 3-405.5)

The CPAF contract is a cost reimbursement type of contract with special fee provisions. It provides a means of applying incentives in contracts which are not susceptible to finite measurements of performance necessary for structuring incentive contracts. The fee established in a CPAF contract consists of two parts: (1) a fixed amount which does not vary with performance, and (2) an award amount, in addition to the fixed amount, sufficient to provide motivation for excellence in contract performance in areas such as quality, timeliness, ingenuity, and cost effectiveness. Award fee may be earned by the contractor in whole or in part. The amount of award fee to be paid is based on evaluation by the government of the quality of the contractor's performance, judged in the light of criteria set forth in the contract. The number of criteria used and the requirements which are represented will differ widely from one contract to another. Therefore, when determining criteria and rating plans, the using activity should be flexible and select a plan which will motivate the contractor in a positive way to improve performance. Evaluations are furnished to the contractor to afford him an opportunity to comment on the evaluation findings. The decision that an award fee has been earned is based on the reports of performance made by the government personnel knowledgeable with respect to the contract requirements. The ATE or TS engineers role is of primary importance in this process and requires detailed knowledge of the system requirements and of the contractor's performance against those requirements. The former is covered in the Requirements Specification Guidebook, CDRL A004.

(c) Cost-Plus-Incentive-Fee (CPIF) Contract (ASPR 3-405.4)

The cost-plus-incentive-fee contract is a cost-reimbursement type contract with provision for a fee which is adjusted by a formula in accordance with the relationship total allowable costs bear to target cost. Under this type of contract, there is negotiated initially a target cost, a target fee, a minimum and maximum fee, and a fee adjustment formula. After performance of the contract, the fee payable to the contractor is determined in accordance with the formula. The formula provides, within limits, for increases in fee above target fee when total allowable costs are less than target costs, and decreases in fee below target fee when total allowable costs exceed target costs. The provision for increase or decrease in the fee is designed to provide an incentive for maximum effort on the part of the contractor to manage the contract effectively.

The cost-plus-incentive-fee contract is suitable for use primarily for development and test when a cost-reimbursement type of contract is found necessary in accordance with ASPR 3-405 and when a target and a fee adjustment formula can be negotiated which are likely to provide the contractor with a positive profit incentive for effective management.

(d) Cost-Plus-Fixed-Fee (CPFF) Contract (ASPR 3-405.6)

The cost-plus-fixed-fee contract is a cost reimbursement type of contract which provides for the payment of a fixed fee to the contractor. The fixed fee once negotiated does not vary with actual cost, but may be adjusted as a result of any subsequent changes in the work or services to be performed under the contract. Because the fixed fee does not vary in relation to the contractor's ability to control costs, the cost-plus-fixed-fee contract provides the contractor with only a minimum incentive for effective management control of costs.

The cost-plus-fixed-fee contract is suitable for use when:

1. a cost reimbursement type of contract is found necessary in accordance with 3-405;

2. the parties agree that the contract should be fee bearing;

3. The contract is for the performance of research, or preliminary exploration or study, where the level of effort required is unknown; and where measuring achievements in contract performance does not lend itself to the subjective evaluation required in CPAF contracts; or

4. the contract is for development of ATE or TS once preliminary exploration, studies, and risk reduction have indicated a high degree of probability that the development is achievable and the government generally has determined its desired performance objective and schedule of completion. ASPR 3-405.6 precludes or limits the use of this contracting method in a number of applicable situations. Consequently the use of CPFF as opposed to CPAF or one of the other methods previously indicated should be considered. It may be noted, however, that CPFF was the method selected for development of these Software Acquisition Engineering Guidebooks.

(e) Fixed-Price Incentive Contracts (ASPR 3-404.4)

The fixed-price incentive contract is a fixed-price type contract, with provision for adjustment of profit and establishment of the final contract price by a formula, based on the relationship final negotiated total cost bears to total target costs.

Under this type of incentive contract, there is negotiated at the outset, a target cost, a target profit, a price ceiling (but not a profit ceiling or floor), and a formula for establishing final profit and price. After performance of the contract, the final cost is negotiated and the final contract price is then established in accordance with the formula. When the final cost is less than target cost, application of the formula results in a final profit greater than the target profit, conversely, when final cost is more than target cost, application of the formula results in a final profit less than the target profit, or even a net loss. Thus, within the price ceiling, the formula provides for the government and the contractor to share the responsibility for costs greater or less than those originally estimated, as determined by a comparison of negotiated final cost with target cost. Because the profit resulting from application of the formula is in inverse relationship to costs, the formula provides the contractor in advance with a calculable profit incentive to control costs. This contracting method has been used for TS and ATE where the system is technically complex and advanced from the standpoint of the total ATE or TS system view point. It is the method normally used for procurement of operational flight training simulators by the USAF. But in these cases, each major element of hardware and software involves only technology which is well within the state of the art and, in most cases, has been demonstrated on previously delivered ATE and TS.

(f) Time and Materials Contracts (ASPR 3-406.1)

The time and materials type of contract provides for the procurement of supplies or services on the basis of (1) direct labor hours at specified fixed hourly rates and (2) material at cost.

This contract type is not applicable to ATE and TS procurement generally. However, it may apply to contractor post delivery support which may be required to maintain ATE or TS software and to assist the USAF in development and maintenance of organic software or hardware maintenance capability.

(g) Additional Incentives (ASPR 3-407)

In addition to the profit incentives to control costs inherent in many of the contract types and combinations thereof described above, there are other means

of providing profit incentives to contractors to obtain extra management attention and effort. Increases in profits or fees resulting from use of incentive provisions may be applied where cost, performance, or other contractual goals or standards have been surpassed.

It is important for the ATE and TS acquisition engineer to understand these concepts. Incentives are awarded on the basis of the government's evaluation of contractor performance. Further, when such incentives are used, senior contractor management performance is frequently evaluated by their company officials on the basis of the degree to which the contractor is successful in earning these additional incentives. Often incentives are awarded on the basis of system performance. Contractors place emphasis on convincing the government their performance warrants maximum incentive award. Therefore, the acquisition engineer is a primary factor, representing the government's interests in such evaluations.

The acquisition engineer, to represent these interests, requires indepth understanding of the ATE or TS system requirements. It also requires that the acquisition engineer have detailed understanding of the contractor's actual performance, including performance of the ATE or TS hardware and software, against these requirements.

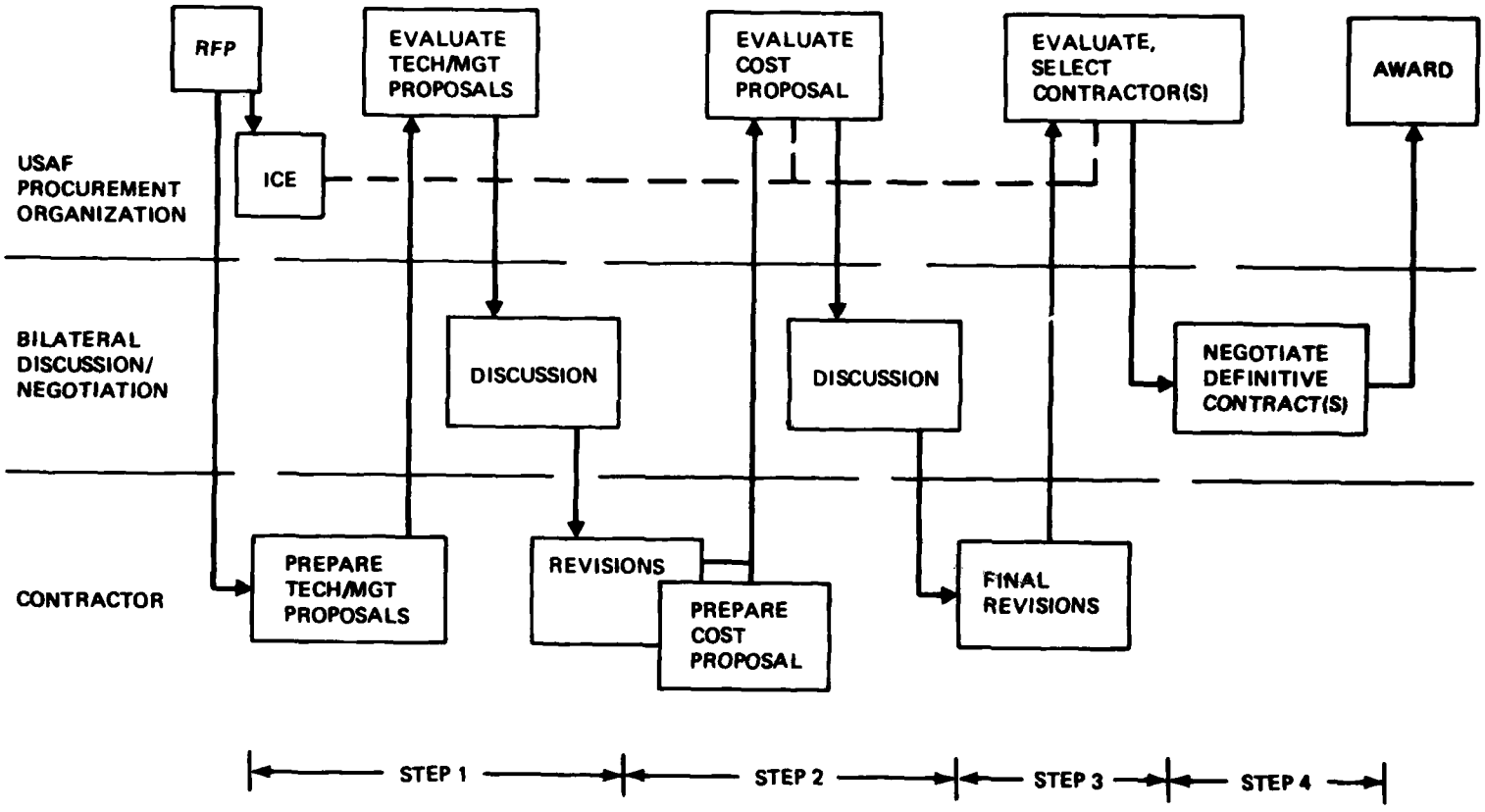
A contract with a performance incentive is one which incorporates an incentive to the contractor to surpass stated performance targets. The incentive provides for increases in the fee to the extent that such targets are surpassed and for decreases to the extent that such targets are not met.

"Performance" refers not only to the performance of the article being procured, but to the performance of the contractor as well. Performance which is the minimum the government will accept, warrants only the minimum profit or fee. Performance which meets the stated targets will warrant the "target" profit or fee. Performance which surpasses these targets are rewarded by additional profit or fee. The incentive feature is applied to performance targets rather than minimum performance requirements.

The incentive should relate to specific performance characteristics. High overall performance is the primary objective of such contracts. When applied to the performance of the contractor, the incentive should relate to specific performance areas or milestones, such as delivery or test schedules, quality controls, maintenance requirements, software reliability, adequacy and timelines of software documentation, suitability of algorithms used by the contractor, etc.

3.1.2.4 Four-Step Procurement. In 1976 the Deputy Secretary of Defense issued a revised DOD Directive 4105.62 (Selection of Contractual Sources for Major Defense Systems) to update the policies and procedures applicable to source selection of major weapon systems. Included in this revised directive was the establishment of a service test for a proposed Four-Step selection process for research and development procurements of advanced engineering, and operational systems. Figure 3.1-1 illustrates this process.

As of this writing the process is still under test. Depending upon the outcome of the tests, Four-Step procurement may be adopted and would therefore be applicable to ATE and TS procurement. Such systems have been identified for procurement by the Four-Step process during the test period. The objectives of the proposed Four-Step process are to improve the overall source selection process, to eliminate or reduce the opportunity for government technical leveling and auctioning, and industry "buy-ins." The Four-Steps in this process are (1) Submission and Evaluation of the Technical Proposal, (2) Submission and Evaluation of the Cost Proposal, (3) Selection of



AUTHORITY: DODD 4105.62

Figure 3.1-1. Four Step Procurement Process

Apparent Winning Contractor, and (4) Negotiation and Award of Definitive Contract.

This process differs from the conventional mode of procurement in two ways:

a. The Four-Step process requires separate submission of the technical and cost proposal whereas in the conventional method, technical and cost proposals are submitted simultaneously. Thus all contractor's technical proposals are evaluated separately from cost proposals.

b. In the Four-Step process, one contractor, of those in the competitive range, is selected for negotiation of a definitive contract. In the conventional method, definitive contracts are negotiated with all contractors in the competitive range. This would have the effect of reducing the time and effort spent in contract negotiation.

3.2 PROCUREMENT PLANNING

The processes by which source selection is performed in accordance with applicable regulations and other command media generally consists of four phases. These phases consist of organizing for and planning the source selection; preparation and release of information to responsible bidding contractors; receipt and evaluation of contractor's proposals; and selection and notification of contract awards. The first of these phases is described in this section. Preparation and release of information is described in Section 4 and Section 5 describes the remaining phases.

3.2.1 Formal Source Selection Process

Figure 3.2-1 provides an events overview of formal source selection processes as contained in AFR 70-15 and its supplements. A more detailed illustration of these activities is provided in Figure 5.1-1.

AFSC Supplement, AFR 70-15 discourages use of formal source selection procedures for systems whose projected costs are less than $1 million. (Most ATE and TS programs exceed this value) Rather it suggests using award procedures specified in ASPR 3-805 and 4-106.

3.2.2 Source Selection Organization

The initial process by which the procurement phase is initiated is the preparation and approval of required operational capability and the establishment or delegation of the source selection organization.

3.2.2.1 Source Selection Organization. The primary organization created for the purpose of source selection consists of the Source Selection Authority (SSA) and those individuals appointed to advise and support his source selection activities. Advisors normally consist of the Source Selection Advisory Council (SSAC) and the Source Selection Evaluation Board (SSEB).

a. AFR 70-15 defines the SSA as the offical designated to direct the source selection process, approve the selection plan, select the source(s) and announce the contract award. The Secretary of the Air Force; undersecretaries or assistant secretaries; or chief of staff are normally designated SSA for major procurements. However, in the case of most ATE or TS procurements this authority is delegated to Hq. Aeronautical Systems Division. The authority usually resides with a senior staff officer such as Deputy for Systems (SD), Deputy for Aeronautical Equipment (AE), Deputy for Engineering (EN), etc.

b. AFR 70-15 recognizes both the SSAC and the SSEB as advisory boards, supporting the SSA during procurement. The former is a group of senior military and/or government civilian personnel. The latter is a group of military and/or government civilian personnel, representing various functional and technical disciplines. The SSEB controls and evaluates

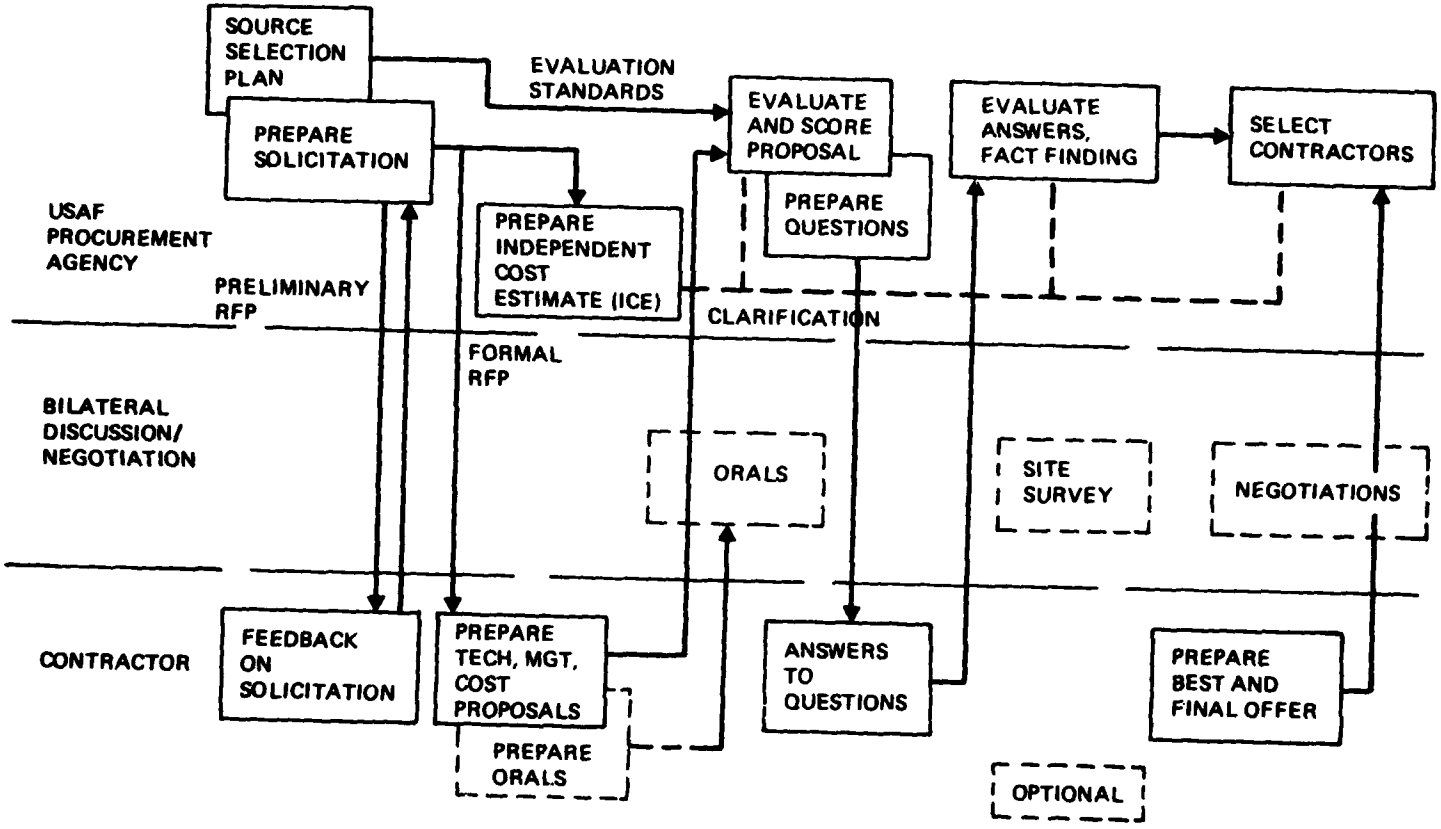


Figure 3.2-1. Source Selection Events Overview

vendor proposals and develops summary findings for recommendation to the SSA through the SSAC. Normally the program manager, that person responsible for management of a program in accordance with AFR 800-2, is chairman of the SSEB. Other acquisition engineers make up the body of the SSEB organization.

c. For most ATE and TS procurements it is unnecessary to use an organization with this degree of formality. Normally the functions of the SSAC and SSEB are combined in one organization and is identified as the Source Selection Evaluation Committee (SSEC). Figure 3.2-2 describes a typical organization appropriate to procurement of TS, ATE and other ground systems. Included in the organization are those acquisition engineering skills necessary to prepare the source selection plan, select prospective contractor sources, prepare the necessary solicitation documents, evaluate proposals and make source selection recommendations to the SSA.

d. Particular requirements of the procurement will normally dictate the need for particular skills. For example a TS with complex visual system requirements may dictate need for computer generated imagery and/or camera model specialists in the SSEC organization. An ATE procurement may be such that ATLAS language specialists be included either as consultants to the SSEC or as part of the SSEC acquisition engineering staff. In general, however, the primary organizational elements shown in Figure 3.2-2 should be staffed with ATE or TS acquisition engineers with board knowledge of state of the art of ATE/TS software, including recent new developments. They should be familiar with the primary USAF suppliers of such systems, and should be well informed on the using command's requirements for the ATE or TS being procured.

3.2.2.2 Responsibilities. AFR 70-15 defines SSA responsibilities. Generally the SSA is responsible for the proper conduct of the source selection process. He approves the source selection plan. The SSA appoints the SSEC chairman and approves selection of SSEC members. He must, through control of disclosure of sensitive information and other actions, ensure the procurement is made in a fair and impartial manner. He approves the solicitation documentation. The SSA establishes criteria for the evaluation of contractor proposals and approves the determination of those contractor's whose proposals have been determined by the SSEC and Contracting Officer to be in the competitive range. He approves the final contractor selection and provides information as necessary to higher authority concerning all matters of the source selection process. Responsibilities of the SSEC are to perform those activities necessary to support the SSA. An overview of these activities is illustrated in Figure 3.2-1.

3.2.3 Source Selection Plan

AFR 70-15 and its supplements, the ASPR and other command media require preparation of plan for approval of the SSA, for organizing and conducting proposal analysis and source selection. Preparation of this plan is the initial significant task of the SSEC. Software acquisition engineers assigned to the SSEC play a significant role in preparation of the plan. The primary factors to be considered are:

a. The plan describes the time phased processes by which potential contractors are to be screened. ASPR 1-902 directs that contract awards shall be made to only qualified and responsible bidders. In addition, ASPR 1.903 and 3-802.2 prescribe the establishment and maintenance of qualified bidders' lists. The software acquisition engineer must determine whether potential contractors have the technical, management, financial, manufacturing and appropriate facility capability. Screening criteria including pre-bidder review meetings, plant visits, etc., necessary to conduct this screening should be included in the plan.

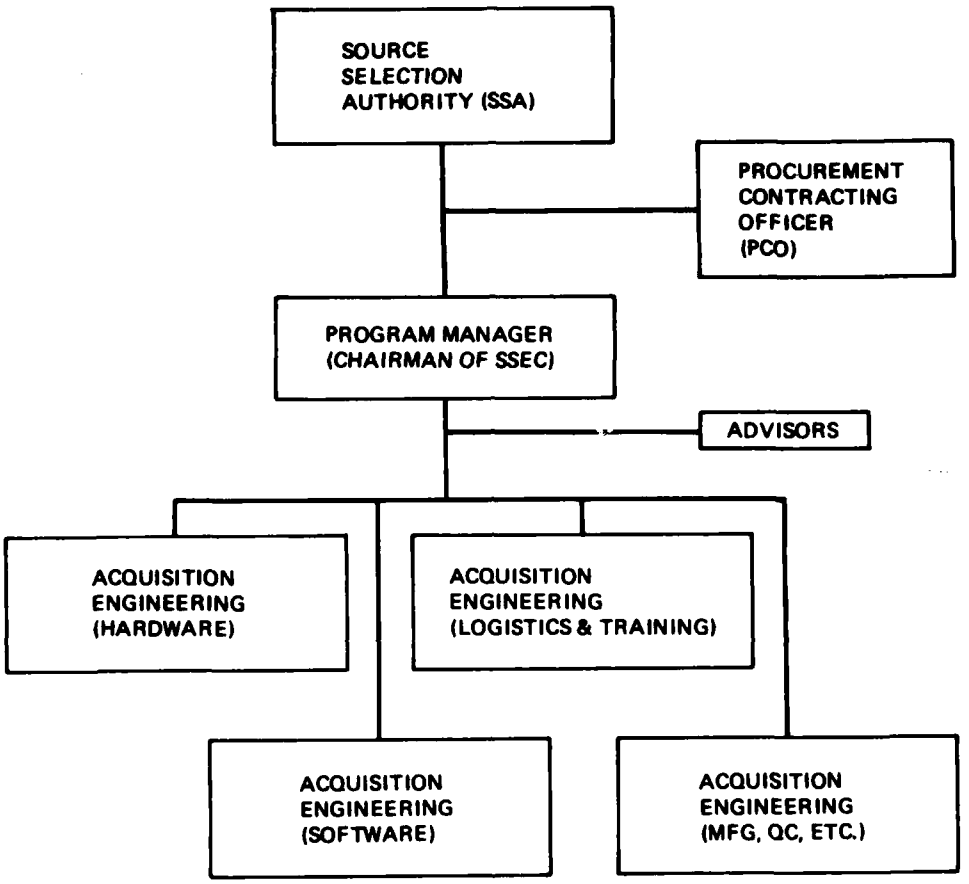


Figure 3.2-2. Typical Procurement Organization – ATE and TS

b. The procurement plan should contain a description of criteria and techniques to be used for evaluation of contractor's proposals. One such criteria is the degree to which the contractor's proposal reflecting a proposed ATE or TS, meets requirements of the RFP and the Required Operational Capability (ROC). Another criteria is the measure of risk, that the contractor can perform the contract in accordance with the requirements of the RFP and of his proposal. The plan should include important performance criteria against which contractors' proposals are to be evaluated. Examples of such criteria include software algorithm accuracy (e.g., alititude must be simulated to an accuracy of 1 foot), and language requirements (e.g., the ATLAS language must conform to IEEE standard 416), etc.

c. The source selection organization should be defined in the plan. A more detailed breakdown of the organizational entities reflected in Figure 3.2-2 should be included with emphasis on those particular skills and resources needed within the procurement organization. Further it should reflect any requested delegation of authority including, where appropriate, delegation of the SSA to a lower level organization.

d. The plan should describe those elements of the TS or ATE for which costs will be evaluated. Of course total cost is always an evaluation criteria; however, it may also be desirable to evaluate the contractor's proposed software costs. If so, it is necessary to include in the plan a requirement to ensure that contractors propose separately identifiable software costs. In addition, the plan should indicate the steps by which the government's independent software cost estimate (ICE) will be determined. Provided the ICE is a reasonable estimate of true costs for the ATE or TS to be procured, comparison of this to the contractors' proposed software costs provides a powerful tool for evaluating whether the contractor really understands the software requirement for the ATE or TS he is proposing.

e. Other items for inclusion in the source selection plan are required by the applicable documentation listed in Section 2.0.

3.3 SPECIAL REQUIREMENTS FOR SOFTWARE ACQUISITION

Software is normally a high risk element in TS and ATE procurement. Where contractors fail to meet cost, schedule and technical requirements, the difficulty can often be traced to a lack of software capability. This section describes guidelines which may be incorporated into contracting for software acquisition as a means of reducing this risk.

a. As previously indicated, a primary requirement of the ASPR is that contractors will be solicited from only qualified sources. This process is summarized in paragraph 5.1.3. One method which may be used to eliminate unqualified sources is the imposition of a minimum applicable experience criteria. Such criteria might, for example, state that contractors will be accepted only from those contractors who have previously delivered a TS or ATE system meeting specified requirements to a branch of the U.S. military establishment. Specific software requirements should be included with the criteria. If such criteria is to be placed in the RFP it should be described in the Source Selection Plan and receive prior approval of the SSA.

b. Particular attention should be given to definition of those items of software and associated documentation to be delivered with the ATE or TS. Most aerospace ground equipment (AGE), including ATE and TS, are procured in a form and quality generally described as "best commercial practice." This means that rather than requirements being defined by applicable Mil Spec, normal commercial practices are satisfactory. This can have significant impact to the USAF when procuring ATE or TS software. It may mean, for example, that no source program listings will be provided unless

specifically required by the RFP. Documentation for the computer system, ATLAS, FORTRAN, BASIC, loading routines, data base management software, etc., may be limited to broad descriptive brochures unless precise requirements are contained in the RFP. It is particularly important to completely specify software form and content and deliverable documentation requirements where it is intended that the TS or ATE system is to be organically maintained by the using command. In most cases the RFP should specifically require delivery of source listings as well as object code.

c. Care should be exercised in the selection of contractor teams. It is common that the prime contractor will obtain components from subcontractors. ATE suppliers purchase computers and computer peripherals, power supplies, freuency counters, and other stimulii and measurement devices from commercial suppliers of such items. Similarly a TS prime contractor purchases computers and instruments from subcontractors and may also subcontract a significant portion of the job, such as the visual system. Because the majority of contractor furnished software for these systems is developed uniquely for each application, it is an integral part of the hardware system. This fact makes it more difficult to subcontract certain portions of the software. This is particularly true of TS software and UUT Test software as well as ATE system unique control and support software such as instrument "templates" and drivers. Therefore particular emphasis should be placed by the acquisition engineer in ensuring that any proposed subcontract relationships are well defined, that interfaces between the prime and subcontractors are well understood and that adequate means will be employed by the contractor to ensure technical integrity of the total software system. In addition it may be useful to reserve the right for USAF prior approval of subcontracts and subcontractors in the RFP.

d. Since software costs are of a high risk nature and constitute a significant cost factor, much can be done during the procurement process to avoid excessive cost. The primary means for doing this is to limit the specifications of software requirements contained in the RFP to that minimum consistent with the required operational capabilities of the ATE or TS. If excessive requirements are placed in the RFP this will be translated into higher cost for the contractor. Further information concerning this subject can be found in the Requirements Specification Guidebook, CDRL A004.

e. One of the primary requirements in contractor selection is determination of whether the contractor has sufficient understanding of USAF requirements to perform adequately. As previously indicated, such techniques as pre-bid conferences, plant visits, etc., are useful means of qualifying contractors. In addition, however, it is necessary to identify contractors who understand the complexities of the particular ATE or TS to be procured. The procurement process can facilitate this by requiring contractors to define in their offerings high technical risk software requirements and describe how they intend to approach these requirements. The RFP should stress the importance of responding with methods and approaches which the contractor proposes to employ.

f. The procurement process should be conducted in such a manner that the using command can assume operations and maintenance responsibility for the system. Particular attention should be devoted to obtaining necessary training of USAF personnel who will operate and maintain contractor furnished ATE and TS software. One scheme is to purchase training and support services using the contracting method described by ASPR 3-406.1 (see paragraph 3.1.2.3). This service would be of a temporary nature only. There is an advantage to obtaining this service as part of the TS or ATE system procurement since the contractor is motivated by competition to avoid overpricing such services.

g. The subject of contractor proprietary software should be given consideration. It is generally the case that software provided with ATE and TS is largely a unique development for the specific system being procured or the software is so general it is in the public domain. Such software, since paid for by the government, becomes the property of the government. Nevertheless, contractors occasionally develop proprietary software which they are reluctant to place in the public domain. In order to avoid post contract award problems caused by a contractor's reluctance to grant ownership of certain software to the government, because it would violate his proprietary rights, specific provisions should be placed in the RFP. In most cases, statements indicating that all software delivered with the system become the property of the government, is sufficient. However, the form of such statements, and legal ramifications thereof, are the responsibility of the Procurement Contracting Officer (PCO) and the acquisition engineer should play only a technical advisory role in this process.

Section 4.0 REQUESTS FOR PROPOSAL AND SUPPORTING DOCUMENTATION

This section summarizes the contracting for software acquisition processes which are concerned with preparation and release of information to qualified bidders. The RFP contents are not described in detail herein since this material is included in the Statements of Work and Request for Proposals Guidebook, CDRL A006. Rather, the material included herein is limited to an overview of the RFP with particular emphasis on its relationship with other procurement activities.

4.1 REQUIREMENTS SPECIFICATION

Requirements often referred to as the "Technical Exhibit" are the technical heart of the RFP. These define the detailed performance capabilities which the ATE or TS is expected to perform. Trade studies and analyses necessary to produce the Requirements Specification together with information content is contained in the Requirements Specification Guidebook, CDRL A004.

a. ASPR 1-1003 requires a synopsis far enough in advance of the issuance of solicitations, to permit interested firms to respond. Several advantages are provided to the SSEC by using the vehicle of the preliminary requirements specification or technical exhibit activity as one vehicle. First, if draft specifications are provided to interested potential contractors for response, the government benefits by having industry involvement early in the requirements specification phase. Often this involvement may provide information to the SSEC which enables avoidance of excessive costs. ASPR 3-106.1 indicates this means may be used not only to help definitize requirements, but as a means of reducing costs of procurement. If both the SSEC and prospective contractors are thoroughly familiar with the TS or ATE requirements before the RFP is released, proposal costs on the part of contractor is reduced and proposal evaluation by the SSEC is reduced. ASPR 3-106.1 indicates responses to such advanced information may be used as an aid to the establishment and maintenance of qualified bidders' lists. The quality of response received from a prospective bidder provides a measure of his interest and capability. Care should be exercised, however, to ensure that bias is not inadvertently admitted into the procurement. It is necessary to practice impartiality by providing the same information to all prospective bidders. Requirements which tend to favor one contractor vs another, should not be included in the RFP unless this is done deliberately, not for the benefit of the contractor but for the benefit of the government. Further, this should only be done with full knowledge and concurrence of the SSA and the PCO.

b. In addition to soliciting evaluation of requirements specification by prospective bidders, evaluation should be solicited from the using command. In many cases using command representatives are SSEC members so that coordination is carried on throughout all stages of the procurement.

4.2 ADDITIONAL RFP DOCUMENTATION

In addition to the specification of requirements, other RFP documentation with which the acquisition engineer is concerned includes the Statement of Work (SOW), schedule, Contracts Data Requirements List (CDRL) and Data Item Descriptions (DID). Other RFP material such as instructions for preparation of cost proposals, terms and conditions, etc., which are prepared by the PCO and his staff normally involves the acquisition engineer in a consulting capacity only.

4.2.1 Statement of Work

The statement of Work (SOW) defines all tasks to be performed by the contractor. In addition it describes each item to be delivered by the contractor and it is therefore necessary that the SSEC ensure

inclusion of all desired deliverable software including the form in which the software is to be delivered. Normally the preliminary SOW is made available for comment by prospective contractors along with the requirements specification.

4.2.2 Contract Data Requirements List

Contract Data Requirements List (CDRL) identifies the data, including program documentation, status reports, technical manuals, etc., to be provided by the contractor. It is important that these requirements be carefully considered by the SSEC prior to final release of the RFP since the contractor is not obligated to supply any data not included in the CDRL. The Computer Program Documentation Requirements Guidebook, CDRL A009, provides guideline factors useful in selecting a CDRL for TS and ATE. In addition it provides checklists for ATE and TS CDRL's. AFR 310-1, together with its AFSC and ASD supplements, defines procedures and guidelines applicable to data acquired under contract.

4.2.3 Data Item Descriptions

Data Item Descriptions (DID) provide format and content of defined data items. Complete DID lists are contained in DOD 5000.19-L. The DID should be tailored to meet the requirements of individual procurements prior to use of DOD 5000.19-L DID's for TS and ATE. Guidance relative to this is included in the Computer Program Documentation Requirements Guidebook, CDRL A009.

Section 5.0 SOURCE SELECTION

This section describes the essential tasks performed by the SSEC to assist the SSA in selection of one or more contractors to provide the ATE or TS.

5.1 ACTIVITIES PRIOR TO RFP RELEASE

Figure 5.0-1 illustrates those activities associated with the source selection process. Because most ATE and TS systems are acquired using negotiated procurement, ASPR references indicated in the figure deal with this procurement method.

5.1.1 Preliminary Considerations

Ideally the source selection process originates with a Required Operational Capability (ROC), originated by the using command and submitted to the Defense System Acquisition Review Council (DSARC). For ATE or TS procured as part of a large system, the system GOR is provided and may make, at most, minimal reference to the ATE or TS. However, where the ATE or TS is of sufficient magnitude, or where the required availability date of the ATE or TS is inconsistent with the host system, a GOR pertaining to the ATE or TS will be reviewed by DSARC. Functions and procedures associated with DSARC activities are included in DODI 5000.2 and DODD 5000.26. The ROC results in one or more Program Management Directives (PMD) which provide specific guidance relative to the ROC and directs any additional study or developmental work deemed necessary by DSARC. Where the ROC and associated study/developmental activity, together with recommendations by DSARC results in OSD and/or Headquarters USAF DCS/R&D approval, a Decision Coordinating Paper (DCP) is issued which summarizes the ATE/TS program features and objectives and defines authority delegated within the USAF for management of the program.

Following these actions an SSA is designated, an SSEC (or SSAC and SSEB) formed and the plan described in paragraph 3.2 is prepared.

5.1.2 ASPR 1003 Requirements

ASPR 1003 requires public notice of pending government procurements. It prescribes that synopsis of the proposed procurement be published in Commerce Business Daily not later than 10 days preceding release of the RFP. This allows potential bidders who are not on the current bidder's list to request the RFP. The SSEC prepares the necessary synopsis which is then released through the PCO.

5.1.3 ASPR 1.903 and 3-802.2 Requirements

ASPR 1.903 and 3-802.2 prescribe requirements for the creation and maintenance of qualified bidder's lists. While it is in the best interest of the USAF to encourage competition, it is nevertheless wasteful of both government and industry resources to encourage prospective contractors to prepare proposals if they are not qualified to perform satisfactorily on the contract. AFR 70-15 specifies that, in developing source lists, all available sources should be considered. Of those sources readily available to the ATE or TS SSEC, pre-release conferences with prospective bidders, including optional plant visits by SSEC members, and evaluation of potential bidder's responses to preliminary RFP material, are probably the most useful.

Of particular concern is the software capability of the prospective bidder. Some points to keep in mind are:

a. Does this potential bidder have an adequate staff of skilled programmers knowledgeable on ATE or TS from which to draw a nucleus? If the potential bidder intends to recruit and train the necessary software staff in the event he wins the contract, it is doubtful he is a qualified bidder in the sense of ASPR requirements.

b. Does the contractor have adequate software development and support facilities? It is often the case with ATE or TS that the computers to be delivered with the system can be used for software development. However, particularly in the case of ATE, the system computer may not be equipped with necessary peripheral devices to support such tasks as ATLAS language compilation in an efficient manner. Further, it is necessary to have adequate key punch and verification facilities, peripheral support printers, etc. to aid program checkout. If the contractor is intending to purchase/lease all required support equipment and dedicate it to the ATE or TS job at hand it is doubtful he can be competitive. Normally computer support facilities are shared between a number of contractor programs and, therefore, the ATE or TS contract should be burdened with only its share of the cost of such facilities.

c. Is the management structure of the company conducive to the contract? The company, if a serious contender, will have established a program or proposal manager, a software manager and at least a small staff of engineers well in advance of the date the RFP is to be released. If by the time the bidder's list is being prepared, the contractor has not done these things, the company may not be sufficiently committed to the job to warrant serious consideration.

d. Does the contractor have adequate prior ATE/TS system experience? AFR 70-15 indicates the screening criteria should include past and present experience regarding performance capability in such areas as logistics support, financial status and (software) production capacity.

e. Final approval of the screening criteria to be applied to any source list is approved by the SSA. It is actually the PCO who determines sources and maintains the source list. Thus in establishing lists the ATE or TS acquisition engineering role is advisory in areas such as those indicated above.

5.1.4 Final Considerations

Advanced ATE and TS procurement information is prepared and released in accordance with ASPR 3-106.2. This includes advanced RFP material, particularly the Statement of Work (SOW) and the technical specifications as indicated in paragraph 4.1. This is a useful process both to the government and prospective bidders. Further, it is an excellent vehicle for establishing useful dialog between the SSEC and prospective bidders. The ASPR's are specific in their requirement to ensure that any item of prerelease information provided to one potential bidder is equally available to all. This can easily be satisfied by, for example, making the same version of the advanced RFP available to all prospective contractors.

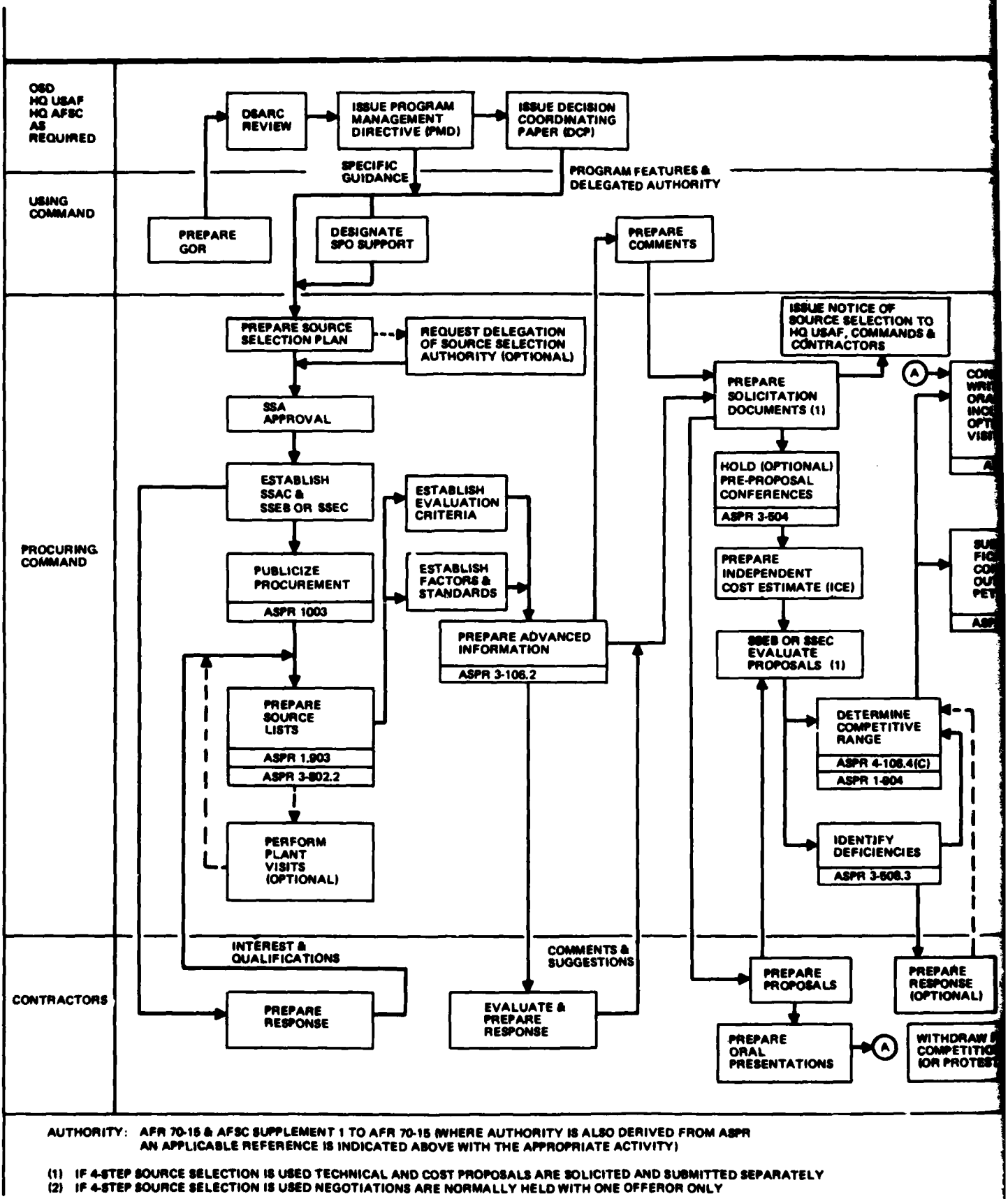
ASPR 3-106.2 specifies that, when this pre-solicitation approach is used, the advanced information is released through the PCO to all known potential contractors. Further, the contractors are requested not only to respond with comments and suggestions, but are requested to provide an expression of interest in the contemplated procurement. Also, ASPR 3-106.2 indicates the prospective contractor may be requested to provide information, such as management, engineering, software, etc. capability.

5.2 PROPOSAL DEVELOPMENT AND EVALUATION

This activity is initiated by the PCO when he formally releases the RFP.

5.2.1 Pre-Proposal Conference

In most cases a pre-proposal conference will be held at the procuring agencies' facilities shortly after release of the RFP. ASPRS 3-504 and 3-106.2 provide requirements for conduct of this meeting. The meeting is chaired by the PCO with the SSEC chairman in attendance. Other members of the SSEC will be present as needed. This meeting, attended by all prospective bidders, provides the oppor-



AUTHORITY: AFR 70-15 & AFSC SUPPLEMENT 1 TO AFR 70-15 (WHERE AUTHORITY IS ALSO DERIVED FROM ASPR AN APPLICABLE REFERENCE IS INDICATED ABOVE WITH THE APPROPRIATE ACTIVITY)

(1) IF 4-STEP SOURCE SELECTION IS USED TECHNICAL AND COST PROPOSALS ARE SOLICITED AND SUBMITTED SEPARATELY
(2) IF 4-STEP SOURCE SELECTION IS USED NEGOTIATIONS ARE NORMALLY HELD WITH ONE OFFEROR ONLY

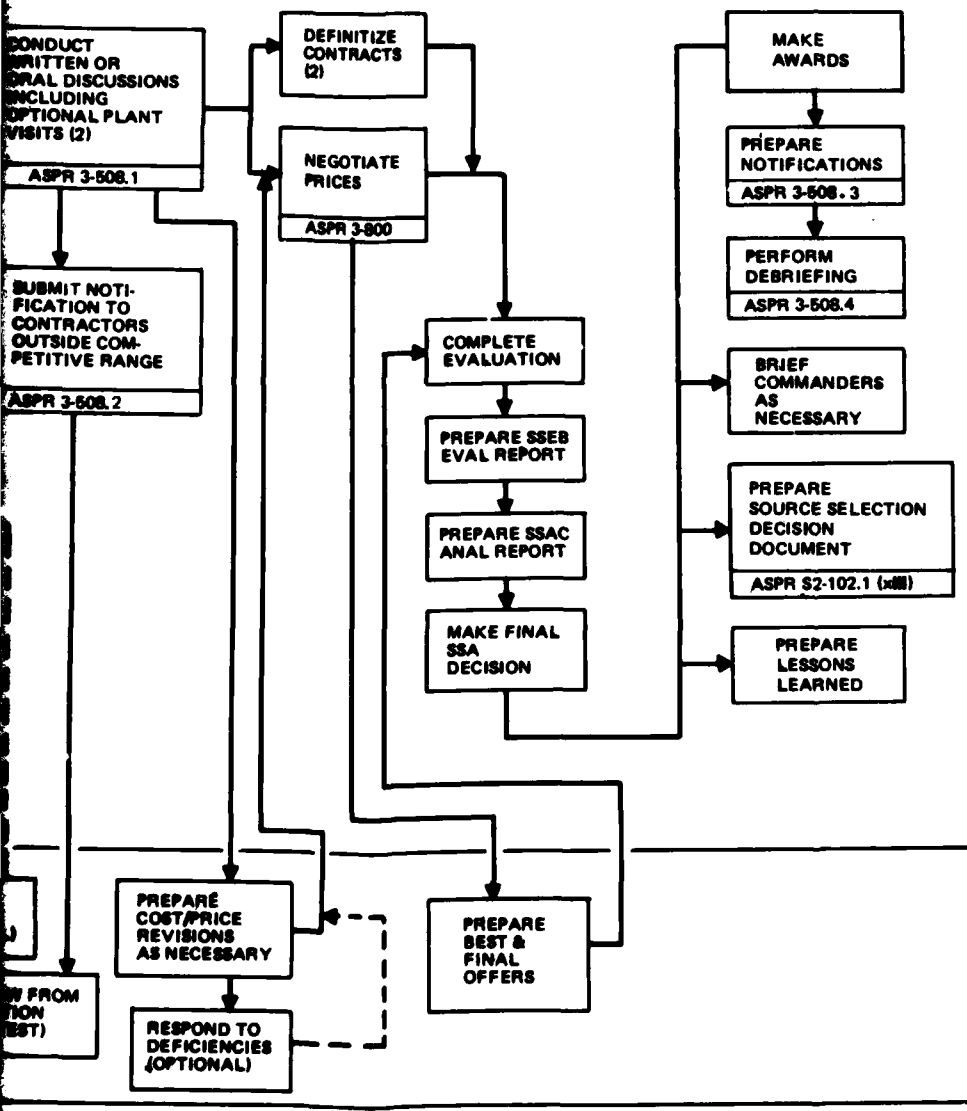


Figure 5.1-1. ATE and TS Formalized Source Selection Process

tunity for bidders to ask questions of clarification. Since each bidder is represented, all are witness to any questions and the answers provided by the government. In many cases bidders are instructed to direct any further questions subsequent to the meeting in writing through the PCO. In this way questions can be prepared and submitted by the PCO to all bidders.

5.2.2 Formal RFP Release

It is normal practice that informal dialog between bidders and SSEC members be terminated with formal RFP release. This is done to ensure that no bidder is availed of information which is not available to every other bidder. Consequently any information exchange between bidders and the SSA/SSEC should be constrained to be handled formally (in writing) and information exchanges should be made through the PCO.

5.2.3 ICE Preparation

AFR 709-15 prescribes the preparation of the Independent Cost Estimate (ICE). It discourages release of this information to prospective bidders. To do so might influence the bidder to make his financial offering against the ICE rather than against his proposed system.

The ATE or TS software acquisition engineer plays a key role in producing the ICE since it is his estimate which is used for the software ICE. The Cost Measuring and Reporting Guidebook, CDRL A003, contains several cost estimating schemes which may be used for this purpose. It is fundamental, however, to each of these schemes that an element of judgement is involved. For example, several of these methods require estimation of the number of computer instructions to be developed for the system to be procured. The validity of the ICE produced is constrained to the degree of validity of this estimate. Consequently this judgement should be exercised carefully and be based on as much actual experience with similar systems previously procured as is reasonably available.

5.2.4 Proposal Evaluation

AFR 70-15 and its supplements provide direction concerning the analysis and evaluation of bidder's proposals. This process consists of scoring and evaluating each proposal, determining those contractors who are in the competitive range, and the identification and handling of proposal deficiencies.

5.2.4.1 Specific Evaluation Criteria. As previously indicated, specific evaluation criteria will have been placed in the source selection plan. The process of proposal evaluation is the process of determining whether the proposal meets the requirements of the RFP in light of the specific evaluation criteria. The following guidelines should be considered in this process.

a. The acquisition engineer need not accept, without question, data presented in the proposal. He should use his knowledge and experience to determine feasibility, logic and reasonableness of the contractor's response. If in doubt consultants should be used to assist the evaluator.

b. The evaluator should have a detailed understanding of the SOW and technical annex. These things provide minimum acceptable response. Where a bidder is found deficient this deficiency should be recorded along with the reasons why this deficiency judgement was made. Such information is extremely important in the event of contractor protest actions.

c. The applicable USAF command media documentation allows latitude on the part of evaluators to perform the evaluation function. It is recognized each evaluator will approach the task based on his own judgement and experience. It is, however, important to evaluate in a consistent manner. That is, the methods and biases assumed by an evaluator should be applied uniformly to all proposals.

d. The evaluation process results in a narrative report. This report, submitted to the SSEC chairman and available for SSA review as required, should be specific rather than general in nature. The report should indicate what was offered; how it met the standard, or how it failed to meet the minimum requirements; what must be done to remedy the deficiency; and what impact (including technical and cost risk) the deficiency correction will have on the overall acceptability of the contractor's proposal.

e. Identification and assessment of risk are important parts of the evaluation process. Certain risks may be inherent in the TS or ATE software because of the particular system requirements, or risks may occur as a result of a particular contractor's approach to satisfaction of those requirements. In making the risk determination, the evaluator should judge the probability of success and, in the event of failure, what alternatives are available to overcome the risks.

5.2.4.2 Proposal Scoring. AFR 70-15 suggests schemes for scoring proposals. Two types of scoring are described; "numerical" (objective) and "narrative" (subjective).

a. The numerical method involves the assignment of a pre-established numerical scale to the designated evaluation factors.

b. The narrative approach does not require the assignment of numerical scores below the item level. It provides the evaluation team personnel with sufficient flexibility to use their judgement as to whether the collective factors met, failed to meet, or exceed the standard, and thus determine the score for the item as a whole. In this way, serious deficiencies impacting the item can be given proper consideration in determining the score assigned.

The scoring of ATE and TS software proposals frequently involves a combination of these methods. The degree to which a contractor's approach to a particular software requirement may be scored numerically. However, a judgement of the adequacy of the proposed software organization, or the proposed allocation of software tasks to the operating system vs "application" programs, or the merits of a data management scheme may best be evaluated subjectively.

5.2.4.3 Proposal Coding. AFR 70-15 suggests use of symbols or color codes as an aid to determine how well the companies' proposal met the standard for each factor.

A "+" sign can be used to indicate that the contractor has exceeded minimum requirements and a " " to indicate that the contractor has met minimum requirements; and a "-" to indicate that he has failed to meet minimum requirements for each factor evaluated.

In using a color code scheme, the following spectrum should be used:

a. Exceptional, or exceeds standards--green;
b. Meets standards--blue;
c. Marginal, or fails to meet standards--yellow;
d. Unacceptable--red.

Upon completion of the factor evaluation of the item, evaluators can determine the designator, from the scale presented below, which best reflects the extent to which the contractor has met the overall item requirements. The scale can be devised as follows:

Evaluation Scale	Color
10--Exceptional	Green
9	
--Exceeds Standards	
8	

7		
6--Meets Standards		Blue
5		
4		
3		
--Fails to Meet Standards		Yellow
2		
1		
0--Unacceptable		Red

Scores may be applied as follows:

a. If the majority of the factors meet standards, the requirement is not overly difficult to meet, and the factors which are deficient are of a very minor nature or are susceptible to easy correction, the item should be scored "5".

b. If the requirement is relatively difficult to meet and the majority of the factors are acceptable, no major deficiencies or risks exist therein, and the collective approach yields a qualitative benefit to the government beyond that which is minimal, a score of 6 or 7 should be assigned, dependent upon the benefits to be attained.

c. If the major number of important factors are acceptable but one or more of the factors are deficient and some minor risk is involved in the correction thereof, the score for the time should be "4".

d. If a majority of the factors for the item are deficient and their correction, either collectively or individually, poses a serious problem in correction, or has a "domino" effect on other design features, or the approach poses a high risk without means for correction, if the approach fails, a score of "3, 2, 1" should be assigned with the lower score indicating a serious or severe condition.

e. If the major factors of the item are deficient to the extent that a major reorientation of the proposal is necessary, or if the approach taken is undesirable and correction would require a major reproposal, the item should be scored "0".

f. If the requirement is particularly difficult to meet and the proposal offers an approach which, with little or no risk, will yield a result which exceeds requirements qualitatively, the item should be scored "8, 9 and 10" dependent upon the level of the exceptional features offered.

g. In assigning numerical scores, it is imperative that a scoring above 5 not be assigned simply because a proposal offers to exceed a requirement in some quantitative way. A simulation fidelity or ATLAS processing capability beyond that required for a given TS or ATE is not necessarily an advantage if this excess capability will not substantially enhance the TS or ATE system. The assignment of score above "5" should reflect some qualitative achievement, such as improved system operability.

h. In some instances, solicitations will indicate a minimum requirement for certain aspects of the system, but will express a "goal" beyond that point which is minimally required. In those instances, scores above "5" should be assigned when a proposal states and the analysis verifies that something beyond the required quantity can be attained.

i. AFR 70-15 indicates the greatest problem posed by the application of any evaluation approach, using numbers denoting how well a proposal meets the factor standard, is the conservativeness displayed by evaluators.

(1) While there is no need to exaggerate findings, it is imperative that the evaluator take advantage of the full

range of scores if circumstances warrant, so that the variances between proposals may be readily identified. The evaluation process does not attempt to classify all proposals as either fully acceptable or as fully unacceptable. One reason for the scrutiny to which the proposals are subjected is to develop the proper numerical scoring for the item beween the maximum (10) and the unacceptable (0).

(2) If the evaluator takes the easy way out by considering all proposals, regardless of their ingenuity or lack thereof, as "meeting minimum requirements," a major purpose of the evaluation effort is lost. When a contractor meets minimum requirements in a way which is simple and effective, he should be given more credit for that effort than if he meets requirements for a task in a complex and difficult manner. In other words, evaluators should strive for a realistic score along the numerical scale which is truly representative of the contractor's ability to satisfy the requirement.

5.2.5 Deficiencies Evaluation

While the analysis of the contractors' proposals pertaining to a factor of the evaluation is being made, the evaluator must perform another task. The evaluator must record, separately and in addition to the narrative analysis, the deficiencies found in each contractor's proposal. Since the individual evaluators cannot determine during the course of the evaluation which of the contractors will be selected in the final competition, it is important that he record in an unbiased manner the deficiencies found and cite the effect the uncorrected proposal will have on the program. This in turn provides the contractors with the opportunity to propose corrective action, and if appropriate, correct their statement of work, end item specifications, schedules, and costs.

5.2.5.1 Minimum Requirements. For the purposes of source selection actions AFR 70-15 defines "deficiency" as any part of a contractor's proposal which fails to meet the government's minimum requirements established in the solicitation. Any proposal part, which, when compared to the standard described for a factor; (1) fails to meet the minimum requirements represented by the standard, (2) proposes an approach which poses unacceptable risk, or (3) is an omission of data which makes it impossible to assess compliance with the standard for that requirement, is considered deficient.

5.2.5.2 Design Approach. In some instances a deficiency may describe an approach taken by a contractor in the design of its system which yields performance which is not desired. Since the selection of a source is dependent upon the combined findings of technical, management, production, logistics, operational aspects, and cost considerations, it is possible that a proposal which initially contained several deficiencies may eventually be selected as the successful one by the SSA. For this reason, deficiencies should be accurately reported by the evaluators so that they may be resolved by the bidding contractor.

5.2.5.3 Comparative Evaluation. Deficiencies identified derive only from individual evaluation of each contractor's proposal against the evaluation criteria/standard, i.e., the government's minimum requirements for the solicitation. In no event should deficiencies derive from a comparative evaluation of the relative strengths and weaknesses of competing contractor's proposals.

5.2.6 Determination of Competitive Range

By law (10 U.S.C. 2301(g)) written or oral discussions must be conducted with all responsible contractors who submit proposals within a competitive range. The PCO makes this determination with support of the SSEC.

5.2.6.1 Competitive Range Evaluation. The competitive range must be determined, after evaluation of all proposals received, on the basis of price or cost, technical, and other salient factors, including proposal deficiencies and their potential for correction, and must include all proposals which have a reasonable chance of being selected. The objective is not to eliminate proposals from the competitive range; on the contray, it is to conduct written or oral discussions to enhance proposal acceptability, thereby facilitating competition and to obtain proposals from which award may be made in the government's best interests, price or cost, technical, and other salient factors considered.

5.2.6.2 Competitive Range Exceptions. After evaluation of all proposals, a proposal(s) may be considered outside the competitive range either initially, without written or oral discussions, or after written or oral discussions with a contractor(s) whose initially evaluated proposal(s) appeared to have a reasonable chance of being selected for award. The following are examples of conditions on which a determination may be made that a proposal does not have a reasonable chance of being selected for award.

a. It does not reasonably address the essential requirements of the solicitation.

b. In research or development procurement, when a substantial design drawback is apparent in the proposal, and sufficient correction or improvement to consider the proposal further would require virtually an entirely new technical proposal.

c. The proposal contains major technical or business deficiencies or omissions, or out-of-line costs, which initial or continuing discussions with the contractor could not resonably be expected to cure. Contractors whose proposals are determined to be outside the competitive range and with whom initial or continuing discussions are not to be conducted, must be so notified promptly in accordance with ASPR 3-508.2.

5.2.6.3 Competitive Range Notification. AFR 70-15 indicates all contractors determined to be in the competitive range and selected to participate in oral or written discussions must be advised of any deficiencies in their proposals, and offered a reasonable opportunity to correct or resolve the deficiencies. It further indicates:

a. Deficiencies must derive from an individual evaluation of each contractor's proposal against the evaluation criteria/RFP. Care should be exercised to ensure deficiencies are not derived from a comparison of one contractor's proposal with another.

b. Discussions should be conducted in a way so as to avoid inadvertent disclosure of competing contractor's strength's, weaknesses, technical information or ideas.

5.2.7 Contract Definitization and Price Negotiation

Depending upon whether conventional or 4-step source selection is emplcyed prices are negotiated and contracts are definitized with one or more potential contractors.

The acquisition engineer's role in this process is primarily required during the Fact Finding process. During this process the SSEC must participate in these negotiations as necessary to support the PCO in his efforts to negotiate the contract which is most advantageous to the government. In so doing the SSEC will, if necessary, challenge the proposed contract which is most advantageous to the government. In so doing the SSEC will, if necessary, challenge the proposed contractor's software planning including his resource estimates for each software subsystem. In negotiated procurements the acquisition engineer should be as much concerned with contractor estimates

which are considered too low as well as those considered too high. Unreasonable cost estimates, either high or low, are usually indicative of lack of understanding of the job by the contractor.

5.3 SELECTION OF CONTRACTORS

Following contract definitization the SSEC prepares an evaluation report and accompanying presentation to the SSA. This report and presentation conveys the results and significant points of the evaluations and makes recommendations concerning awards. Following his review the SSA makes a final decision.

This decision is documented in the source selection Decision Document in accordance with ASPR S2-102.1(xiii). Notification of awards is made, both to successful and unsuccessful bidders, by the PCO. ASPR 3-508 prescribes the required notifications. AFSC Sup 1, AFR 70-15, contains guidance on debriefing of contractor in accordance with ASPR 3-508.

Debriefing of *unsuccessful bidding* contractors is required whenever a contract award is made on some basis other than price and its purpose is to assist contractors in upgrading their future proposals. Here the basic intent is to tell the unsuccessful contractor where his proposal was considered weak or non-responsive in relation to the evaluation criteria. An excellant source of such information is the deficiency reports which were not fully addressed by the contractor and resolved to the government's satisfaction.

A final source selection activity of the SSEC is preparation of a Lessons Learned documentation.

5.3.1 Documentation Preparation

AFR 70-15 and its supplements define requirements on SSEB and SSAC evaluation and analysis reports and associated presentations. Since for the majority of ATE and TS procurements, SSEB and SSAC functions are combined under the SSEC, one analysis report is normally produced. However, the format and contents provided in Attachment 4, AFR 70-15, are applicable.

a. The information provided contains a summation of the evaluation and narration of both scored (quantitative) and unscored (qualitative) evaluation items. AFR 70-15 suggests making each contractor assessment precise. It should highlight strengths, weaknesses and risks associated with each proposal. It also suggests reporting cost information in two separate sections.

b. Items should be presented in unweighted, or raw score form. The end result is an evaluation of each proposal against solicitation requirements based on evaluation criteria/standards. No comparison of one contractor against the standard of another contractor's offering should be made.

c. The report should portray, in narrative form, the evaluation results of *each* proposal as originally submitted, as well as results of deficiency disposition and of negotiation actions.

d. Attachment 3, AFR 70-15 provides a format for reporting the disposition of deficiencies. Generally this includes, along with an identification of the contractor and the evaluation item, a description of the nature of the deficiency, the effect of the deficiency on the program if accepted "as is" and references which substantiate that the offering is deficient. This is approved by the evaluator and SSEC chairman.

5.3.2 Lessons Learned Report

AFR 70-15 requires submittal of a Lessons Learned Report within 8 weeks after the SSA decision. AFSC Sup 1 requires submittal within 45 days after contract award. This report is prepared by the SSEC for submittal to the SSA. It covers those particular events which occurred

during the source selection activity which would be helpful in avoiding pitfalls in future procurements. The referenced regulations are non-specific on a particular format or the detailed content requirements of this report.

Section 6.0 ACQUISITION MANAGEMENT

Contracting for software acquisition continues beyond the source selection process. This section summarizes this continuing activity.

6.1 POST AWARD ACTIVITIES

The primary task of the acquisition engineer subsequent to contract award is support of the SPO Director in his management of the acquisition from the standpoints of cost, schedule and technical integrity. These subjects are covered in the Cost Measuring and Reporting Guidebook, CDRL A003, the Measuring and Reporting Software Status Guidebook, CDRL A008, the Reviews and Audits Guidebook, CDRL A00F and the Management Reporting Guidebook, CDRL A00G. This paragraph provides an overview of applicable regulations.

6.1.1 AFR 800-6 Requirements

AFR 800-6 provides policy, establishes reporting requirements, assigns responsibility and establishes procedures for the application of financial management control techniques to Air Force acquisition and modifications programs. While it is applicable only to major programs, its concepts are nevertheless applicable to smaller programs. In addition, TS and ATE systems procured as integral parts of larger systems are subject to the letter of AFR 800-6.

The technique of AFR 800-6 involves structuring a larger program into smaller more manageable elemental tasks by virtue of a Work Breakdown Structure (WBS). Under this process the software will have been categorized into its principal components. AFR 800-17 provides general guidance for WBS development and MIL-STD-881A provides a standard method for structuring a program summary WBS.

The WBS provides the initial key to successful management by the SPO. As previously indicated it reduces the complex program to a number of smaller, more manageable tasks. The entire system by which contractor cost, schedule and performance data is obtained and evaluated by the USAF is based on the WBS.

AFR 800-6 thereby further establishes the methods and requirements for planning for cost expenditures by the contractor, reporting of expenditures against these plans and management of contractor financial activities.

Of particular concern to the acquisition engineer is the analysis of contractor supplied software cost data where the ATE or TS has been procured on a cost reimbursement basis.

Further, even for fixed price contracts, acquisition engineer awareness of the actual software costs, through use and understanding of the financial information provided by the contractor, is important. Frequently Supplemental Agreements (SA) will be negotiated when changes occur. TS and ATE systems for new, evolving weapon systems are susceptible to significant changes in requirements. The knowledge of actual cost is an extremely useful aid to determination of reasonableness of software estimates, and negotiating price increases with the contractor.

6.1.2 AFR 800-14 Requirements

AFR 800-14 establishes policy for the acquisition and support of computer equipment and software included as integral parts of other systems. It establishes for formal reviews, both to determine schedule and technical performance. It requires that engineering and technical direction of engineering efforts must be reviewed on a periodic basis to determine the technical adequacy of contractor efforts in meeting system requirements. A discussion of formal reviews specifically detailed in MIL-STD-499A and MIL-STD-1521 is provided.

Key elements, insofar as the acquisition engineer is concerned are as follows:

a. Computer program functional flow diagrams should be periodically reviewed and actual status of the activities reflected therein.

b. Requirements allocation sheets, indicating in which program modules various ATE and TS system requirements are allocated, should be audited periodically.

c. Program milestones for such activities as preliminary computer program requirements, computer program design, flow charting, coding, subsystem checkout and software integration activities should be scheduled. These schedules should be kept up to date and the contractor's actual performance against these schedules should be periodically reviewed and audited.

d. The ATE and TS acquisition engineer should be aware of trade studies made by the contractor and why decisions based on these trades were made as they were.

e. High technical risk areas should be reviewed frequently. Particular attention should be given to the adequacy of the approaches the contractor is taking to reduce the risk.

f. The USAF should carefully monitor software language and computer operating system activities of the contractor. Compilers, assemblers and operating systems supplied with commercial computers of the type used in ATE or TS are normally maintained by the computer vendor. It is necessary to maintain configuration control of these software elements as well as the application software being developed by the contractor.

g. Detailed review and audit should be conducted by the USAF of such things as message formats, TRD implementation by ATLAS, memory utilization, data base design, FORTRAN use or machine language coding of real time TS algorithms, etc. Through detailed knowledge of such things and knowing where the contractor is with respect to his plans, the acquisition engineer can effectively manage the software engineering process.

6.2 CONTRACT CHANGES

The regulations and other command media previously identified are equally applicable to contract changes. Such changes come about for a variety of reasons. ATE and TS are, in many cases, the "slave" of the weapon system of which the ATE or TS is a part. As the configuration of an airplane evolves or is altered, so must the flight simulator be altered. As an electronic system is changed the UUTs to be tested by ATE change and this can have significant impact on the ATE being procured. The ATE or TS acquisition engineer becomes involved in this change throughout the acquisition process. AFR 800-12 identifies as high change sensitivity, prototype support equipment and that which is obtained as deferred development. The ATE or TS acquisition engineer is involved in the change process in the following ways.

6.2.1 Required Changes

The acquisition engineer may be the first to be aware of the need for change and, therefore, the first to communicate technical change requirements to the contractor. He should therefore endeavor to establish and maintain effective contractor communications and be in a position to discuss software technical requirements in detail in order to minimize the cost and schedule impact of changes.

6.2.2 Required Change Impact

The acquisition engineer plays a heavy role in fact finding and cost negotiation for contract changes. Contractors are not normally susceptible to the pressures of competition for contract changes. Therefore their evaluation of

contract change impact will often be made in a more conservative fashion. It is up to the acquisition engineer to evaluate the reasonableness of contractor change proposals in this regard.

6.3 CONTRACT TERMINATION

The process by which termination of a TS or ATE contract occurs is normally through execution by the PCO of a form DD250. However the acquisition engineer's role in this process is in determination whether the ATE or TS system meets the specifications prepared for it. In order to determine that the contractor has complied with every item in the software specification, the acquisition engineer will determine that each specification Section 4 software verification requirement has been met. Software requirements for TS and ATE are verified by test, by analysis and/or by inspection.

a. For those requirements verified by test, the acquisition engineer reviews test directives and procedures, test results and ensures the procedures have been satisfied.

b. For those verification requirements satisfied by analysis, the contractor will have prepared analysis reports. The acquisition engineer reviews these reports and then determines technically whether the analysis conducted by the contractor verifies the particular condition.

c. Requirements verified by inspection are normally associated with verification that certain software and documentation has been supplied. The contractor will have conducted the necessary inspections and will have reported this fact through contract compliance channels. The acquisition engineer may be called upon to certify adequacy of these inspections and to determine through his own inspection whether all software items required by the contract have been delivered.

Section 7.0 BIBLIOGRAPHY

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Section 8.0 MATRIX: GUIDEBOOK TOPICS VS GOVERNMENT DOCUMENTS

Figure 8.0-1 is a cross reference matrix showing the guidebook topics and government documents which address each topic. Elements in the matrix indicate guidebook sections in which the topic is discussed.

TOPICS \ GOVERNMENT DOCUMENTS	AFR 70-15	AFSC SUP 1 AFR 70-15	AFR 800-12	AFR 300-2	AFR 800-2	ASPR'S	AFR 310-1	DOD 5000.19-L	AFR 800-14	AFR 800-6
ATE & TS CONTRACTING	3.1					3.111 3.112 3.113				
PROCUREMENT PLANNING	3.2	3.2				4.1				
SPECIAL REQMTS FOR SOFTWARE ACQUISITION			3.3	3.3		3.3.6				
REQUIREMENTS SPECIFICATIONS						4.1				
ADDITIONAL RFP DOCUMENTATION							4.2.2	4.2 4.2.3		
ACTIVITIES PRIOR TO RFP RELEASE	5.1	5.1				5.1 5.1.4				
PROPOSAL DEVELOP & EVALUATION	5.2.4	5.2.4				5.2.5				
SELECTION OF CONTRACTORS	5.3	5.3				5.3				
POST AWARD ACTIVITIES				6.1 6.2					6.1	6.1
CONTRACT CHANGES						6.2			6.2	6.2
CONTRACT TERMINATION						6.3				

Figure 8.0-1. Guidebook Topics Versus Government Documentation

Section 9.0 GLOSSARY OF TERMS

Algorithm - A set of rules or processes for solving a problem in a finite number of steps. This software procedure can be presented to a computer precisely and in a standard form, the computer then takes the algorithm's course of action to solve the problem.

Armed Forces Procurement Regulation - An interservice publication which is the basic source-book for the procurement process. The ASPR is the "Bible" for all contracting by the DOD upon which Air Force regulations and manuals interpret and implement the requirements and policy found therein.

Computer Program - A series of instructions or statements in a form acceptable to computer equipment, designed to cause the execution of an operation or series of operations. Computer programs include such items as operating systems, utility programs, and maintenance/diagnostic programs. They also include applications programs such as payroll, inventory, control, operational flight, strategic, tactical, automatic test, crew simulator and engineering analysis programs. Computer programs may be either machine dependent or machine independent, and may be general purpose in nature or be designed to satisfy the requirements of a specialized process of a particular user.

Contract - A legally enforceable agreement between two parties (AF/Contractor, Contractor/sub-contractor) which describes a program for product acquisition. The contract contains the System Specifications, the Statement of Work, the Contract Data Requirements List, and the Work Breakdown Structure.

Control Software - Software used during execution of a test program which controls the nontesting operations of the ATE. This software is used to execute a test procedure but does not contain any of the stimuli or measurement parameters used in testing a unit under test. Where test software and control software are combined in one inspeparable program, that program will be treated as test software. (AFLC 66-37)

Data Base - A collection of program code, tables, constants, interface elements and other data essential to the operation of a computer program or software subsystem.

Life Cycle Analysis - An analysis of a systems total cost to the government over its full life. It would include the cost of development, production, operation, support, and if applicable, disposal.

Logic Flow - A diagrammatic representation of the logic sequence for a computer program. Logic flows may take the form of the traditional flow charts or in some other form such as a program design language.

Organic - A term used to designate a task performed by the Air Force rather than a contractor.

Software - A combination of associated computer programs and computer data required to enable the computer equipment to perform computational or control functions.

Source Selection - The process of selecting which among competing contractors shall be awarded a contract. A significant portion of this involves evaluation of proposals to determine the degree to which the government's requirements would be satisfied.

Support Software - Auxiliary software used to aid in preparing, analyzing and maintaining other software. Support software is never used during the execution of a test program on a tester, although it may be resident either on-line or off-line. Included are assemblies, compilers, translators, loaders, design aids, test aids, etc. (AFLC 66-37)

System Engineering - The application of scientific and engineering efforts to transform an operational need or statement of deficiency into a description of systems requirements and a preferred system configuration that has been optimized from a life cycle viewpoint. The process has three principal elements: functional analysis, synthesis, and trade studies or cost-effectiveness optimization.

Test Software - Programs which implement documented test requirements. There is a separate test program written for each distinct configuration of unit under test (AFLC 66-37).

Validation - Computer program validation is the test and evaluation of the complete computer program aimed at ensuring compliance with the performance and design criteria.

Verification - Computer program verification is the iterative process of continuously determining whether the product of each step of the computer program acquisition process fulfills all requirements levied by the previous step, including those set for quality.

Work Breakdown Structure - A standard method for structuring a program into its various required work tasks. A Work Breakdown Structure is implemented per MIL-STD-881A under the guidance in AFR 800-17. When subdivided as necessary by the contractor to identify tasks associated with a single responsible organization, it provides a basis for contract planning, status determination, and reporting.

Section 10.0 ABBREVIATIONS AND ACRONYMS

AFLCP	Air Force Logistics Command Pamphlet
AFPRO	Air Force Plant Representative Office
AFR	Air Force Regulation
AFSCP	Air Force Systems Command Pamphlet
AGE	Aerospace Ground Equipment
ASPR	Armed Forces Procurement Regulation
ATE	Automatic Test Equipment
ATLAS	Abbreviated Test Language for All Systems
CCP	Contract Change Proposal
CDR	Critical Design Review
CDRL	Contract Data Requirements List
CFSR	Contract Funds Status Reports
CPAF	Cost Plus Award Fee
CPFF	Cost Plus Fixed Fee
CPIF	Cost Plus Incentive Fee
CPR	Cost Performance Report
CPU	Central Processing Unit
CRT	Cathode Ray Tube
DBMS	Data Base Management System
DCP	Decision Coordinating Paper
D&D	Design and Development
DID	Data Item Description
DOD	Department of Defense
DODI	Department of Defense Instruction
DSARC	Defense System Acquisition Review Coucil
ECP	Engineering Change Proposal
ESD	Electronic Systems Division
HOL	Higher Order Language
ICE	Independent Cost Estimate
O&M	Operational and Maintenance
O&S	Operational and Support
PCO	Procurement Contracting Officer
PMD	Program Management Directive
RDT&E	Research, Development, Test and Evaluation
RFP	Request for Proposal
ROC	Required Operational Capability
SA	Supplemental Agreement
SAE	Software Acquisition Engineering
SOW	Statement of Work
SPO	Systems Program Office
SSA	Source Selection Authority
SSAC	Source Selection Advisory Council
SSEB	Source Selection Evaluation Board
SSEC	Source Selection Evaluation Committee
TRD	Test Requirement Document

TS	Training Simulator
USC	United States Code
UUT	Unit Under Test
WBS	Work Breakdown Structure

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