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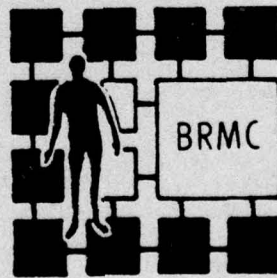
# SEMIANNUAL BUSINESS RESEARCH REPORT

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A Compendium Prepared by:

Air Force Business Research Management Center

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<p>This report is a compendium of acquisition-related research being performed in the USAF. It is designed to give the reader a quick overview of the research efforts and provides sufficient information to follow-up on projects of interests.</p>		

⑥ SEMIANNUAL BUSINESS RESEARCH REPORT  
Volume 5, Number 1

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Air Force Business Research Management Center  
Wright-Patterson AFB, Ohio 45433

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\*Featured research area for this issue.

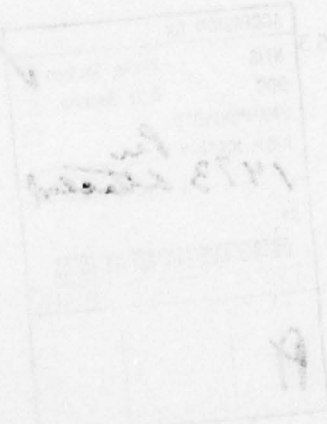
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\*One-half of the research program is reported each issue. Therefore, for an Annual report, both issues should be reviewed.



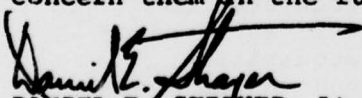
## FOREWORD

This report is part of a continuing effort to provide the procurement/acquisition community with current, accurate, and complete information on problem areas which are of general concern. As such, the report cannot provide "answers" to the problems currently on a desk. Rather it is intended to provide indications of how the problem can be better defined or how someone else has solved similar problems. For keeping informed about what new information is being developed in the procurement and acquisition function, however, this report should be high on every reader's list of required reading.

The report is designed to provide summary level information. For more detailed information, we provide executive summaries, one- to three-page narratives, of the most promising research. Final reports are also available for readers who wish to study the work in detail. The BRMC research manager will be pleased to provide any further information desired.

For prospective researchers, the report provides brief descriptions of research needs which have come to our attention. In our experience it is virtually impossible to communicate in writing in sufficient detail to permit researchers to initiate study on the basis of a written description of the problem. Our intention, therefore, is to spur interest and thought. Researchers whose areas of interest are not mentioned are encouraged to call the BRMC research manager and discuss their proposed research with him. We are always glad to learn of promising opportunities.

Similarly, we encourage procurement/acquisition community members to provide problems for potential research subjects and to bring to our attention promising study results which may have escaped our net. In doing so, you will greatly assist us in creating one of the primary values of this report: a continuing dialog regarding the problems and issues which concern the procurement and acquisition communities today, and those which should concern them in the future.

  
DANIEL E. STRAYER, Lt Col, USAF  
Executive Director  
Air Force Business Research Mgt Center

## ORGANIZATION OF THE REPORT

The Air Force Business Research Management Center (BRMC) is a focal point, under AFR 20-5, for procurement/acquisition-related research studies. Operating under the functional guidance of HQ USAF/LGP, the BRMC matches acquisition problems with existing research capabilities, manages and monitors selected research efforts, tests research results, and when warranted assists in implementing resulting recommendations for improvement. The BRMC also functions as a consultant for the purpose of assisting management in utilizing the information flowing from the procurement and acquisition research program. To provide a framework for conceptualizing the procurement/acquisition process, the BRMC has defined the following "acquisition practices:"

Requirements Generation - Processes of establishing needs to be satisfied by acquisition from the private sector of our economy.

Business Strategy - All processes involving the establishment of business management plans, contractual relationships, and the alignment of specific Air Force functions involved in establishing a business relationship with the private sector.

Program Management - The processes of planning, organizing, and controlling internal Air Force activities to insure that contracted program needs are satisfied.

Logistics - All processes related to the provision of life cycle systems support.

Business Environment - Those aspects of our procurement/acquisition process which are designed to permit us to accommodate conditions which arise externally and over which we have no direct control.

These acquisition practices are divided into research areas and further subdivided into individual research projects. A BRMC research manager is responsible for relating the ongoing research effort in each area to other research efforts in that area, as well as to other research areas in the total procurement/acquisition process. The research manager is thus in a unique position to assist operating managers and potential researchers to assure that their knowledge base is both current and complete.



RESEARCH PROGRAM STATUS

PART I

RESEARCH PROGRAM STATUS

REQUIREMENTS GENERATION: Processes of establishing needs to be satisfied by acquisition from the private sector of our economy.

#### SUPPORT ACQUISITION

Area Manager: Captain Paul W. Gross, Jr.

Objective: To develop processes for translating environmental information from the civilian sector to the logistics requirement process via the support acquisition process.

Background: Support acquisition is the transformation process that communicates the needs of the logistics requirements system to the civilian sector of the economy and the conditions prevalent in the economy back to the logistics requirements generation system. The transformation process should communicate timely needs to insure that spares and equipment are available to support the mission requirements of the Air Force. In the same vein, the transformation process should effectively communicate information from the economy back to the logistics requirements generation system to insure that pertinent input variables are considered. Due to the relatively stable conditions in the economy in the past years, the environmental feedback was minimal. Acquisition methods were developed and institutionalized to achieve the objective of mission support, but the ability to accept, translate, and internalize environmental feedback in the logistics requirements generation system was not emphasized. Rapid inflation and material shortages with associated production bottlenecks have combined to greatly increase the difficulties of achieving our support objectives.

Projects Completed(\*)/In Progress: None

BUSINESS STRATEGY. All processes involving the establishment of business management plans, contractual relationships, and the alignment of specific Air Force functions involved in establishing a business relationship with the private sector.

#### CONTRACTOR MOTIVATION

Area Manager: Lieutenant Colonel Daniel E. Strayer/  
Captain Ray E. Fellows

Objective: To develop improved understanding of the motives which shape the actions of public and private institutions in the marketplace for unique products and services.

Background: A large segment of economic activity involves institutions, public and private, which are procuring unique products or services frequently involving long time spans and requiring significant technological or managerial innovation. The specialized nature of these one buyer-one seller situations has led to growing realization that market theory economics is in some important respects an unsatisfactory guide for policy and actions. Although numerous approaches have been proposed to secure the advantages of competitive market behavior to the one buyer-one seller environment, many serious policy issues require more accurate understanding of contractor motivational patterns. This topic may be approached through a number of avenues such as contract incentives, capital investment policies, nonfinancial barriers to entry (e.g., red tape), related research areas include Life Cycle Cost (September Report) and Impact of Socio-Economic Programs (pages 25-28 of this report).

#### Projects Completed(\*)/In Progress:

Project Number I-3-8-76. "Impact of Contract Parameters on Ultimate Contractor Performance," Jerold L. Zimmerman and Kenneth M. Gaver, The University of Rochester, Rochester, New York.

Summary: The purpose of this study is to develop a data base amenable to the empirical analysis of U.S. Air Force incentive type contracts and to conduct a preliminary investigation to identify and isolate empirical relationships that can be modeled analytically and tested statistically. It involves an investigation of present Air Force contract data and the establishment of a data base to be used by researchers investigating contractor



motivation. The research effort also includes the accomplishment of an empirical study to attempt to evaluate the impact of certain parameters on contractor performance. The key variables of interest include: target profit rate, the share rate, the bid or target price, and the factor relating ceiling price to target price. This study should be completed in mid-1977.

#### PROCUREMENT PRODUCTIVITY

Area Manager: Captain Peter J. Perkowski

Objective: To increase the effectiveness and productivity of the Air Force procurement function.

Background: In 1970 the Comptroller General initiated a study to determine the feasibility of measuring the productivity of the federal sector. Within DOD, this effort culminated in the publication of DOD Instruction 5010.34, "Productivity Enhancement, Measurement, and Evaluation - Operating Guidelines and Reporting Instructions." Although this instruction recognizes that both efficiency (productivity) and effectiveness are components of performance, initial measurement efforts have primarily targeted the efficiency aspect. As a measure of efficiency, the Air Force procurement function is currently measured by the ratio of the number of contractual actions to the paid man-years worked during the time period. Although this measure meets the reporting requirement, senior managers know that it is not a wholly satisfactory base from which to develop and implement productivity enhancement programs.

The most significant research to improve measurement of the procurement function has been done by the U.S. Air Force Academy. In 1974 they developed a productivity measurement system which systematically captures information regarding changes in workload mix and personnel. Their program uses the number of contractual actions weighted by complexity as the output index and the number of personnel assigned weighted by grade as the input index. The ratio (output/input) is computed and reported as an aggregate Air Force figure. As computed by their program, Air Force procurement productivity is increasing. However, examination of their input index reflects a steady decrease in the apparent quality of our work force. The resulting question is, "Are we maintaining high quality in our procurement actions?"

Although follow-on studies have been accomplished to explore the question of quality assessment, a measurement has not yet been developed.

Significance: Performance improvement is a basic managerial goal. As resources become scarce, this goal assumes increased importance. Procurement resources are becoming more scarce, and apparently the experience of our work force is declining. Consequently, performance improvement is critical to continuing effective mission accomplishment.

Projects Completed(\*)/In Progress:

1. Project A-5-2-74. "Longitudinal Study of Affective Responses of Buyers/Contract Negotiators to Job Enrichment," Major W. Rosenbach, University of Colorado.

a. Summary: This study was to address the effectiveness of Orthodox Job Enrichment (OJE) as it pertained to the procurement function at the Ogden Air Logistics Center, Hill AFB, Utah. Due to organizational changes, however, the planned study has been discontinued.

b. Significance: This project was to address the problem of evaluating a productivity/performance enhancement program in the procurement environment.

2. Project A-5-5-76. "Measuring Productivity Changes in Procurement," Lieutenant Colonel Richard W. Fortner, USAFR.

a. Summary: This study will test the methodology developed by the U.S. Air Force Academy to measure changes in procurement productivity. Specifically, it will produce productivity data for subcommand level procurement functions and attempt to assess its managerial usefulness. Projected completion is May 1977.

b. Significance: This study is in the labor productivity area of efficiency measurement. If satisfactory progress can be made with subcommand productivity measurement, the researcher plans to extend the study to address quality factors within the total procurement performance measurement at the subcommand level.

3. Project A-5-7-77. "Quality Improvement System For Procurement Instruments (QISPI)," Mr. Monte G. Norton, Army Procurement Research Office (APRO).

a. Background: This study, by the Army Procurement Research Office (APRO), was performed in response to a need by the Army Material Development and Readiness Command (DARCOM) for a reliable system to control the quality of procurement instruments and provide useful information regarding document quality.

b. Summary: The QISPI described in the study includes a quality indicator (QI) calculation for document quality measurement and control. Standard control charts are used to determine document acceptability and track quality levels at the commodity commands. The QI values from each command are adjusted at the Headquarters DARCOM level to reflect review board proficiency and sampling percentages which result in the final performance indicator (PI) calculation for all of DARCOM.

c. Significance: This report (APRO 613-1) dated February 1977 was published by the U.S. Army Procurement Research Office, U.S. Army Logistics Management Center, Fort Lee, Virginia 23801. It is included as a "Project in Progress" because the QISPI has been tested at two U.S. Army Commodity Commands. The test results are being evaluated at the APRO. A final report will be published following the system test evaluations. The report will present the test results and any required system modifications, as well as recommendations for implementation throughout DARCOM. The BRMC is interested in this study because it may be of benefit to Air Force-instituted procurement instrument quality control systems.

Related Activities:

BRMC is coordinating Air Force participation in a National Science Foundation (NSF) funded study to assess the methods currently being used to measure purchasing performance. The study team from Michigan State University will assess a cross section of industry and government organizations. The results will be published in monographs and articles and serve as a basis for seminars to discuss effective purchasing measurement.

A NSF grant was issued in May 1976 to a research team headed by Dr. E. Adam, University of Missouri-Columbia, to examine the question of quality measurement in service



organizations. Although the study will specifically examine the service organizations of several Federal Reserve Banks, the resulting methodology could be transferable to the Air Force or DOD procurement environment. Data has been collected from approximately half of the Federal Reserve Banks participating in the study. Data collection should be completed by the summer of 1977 and final report published by the winter of 1977-78.

Research Opportunities: Several challenges are available to researchers interested in productivity/performance measurement and enhancement. Among them are:

- a. How do we quantitatively assess the quality of the procurement function?
- b. What variables should be included in a total procurement performance measurement system?
- c. What enhancement programs are best suited to the procurement function?
- d. How should an individual manager determine which enhancement program to use in his organization?

PROGRAM MANAGEMENT: The processes of planning organizing, and controlling internal Air Force activities to insure that contracted program needs are satisfied.

#### PRODUCTION MANAGEMENT

Area Manager: Captain William L. Glover

Objectives: Examine, define, and understand the implications of production management to the acquisition process by documenting specific strengths and weaknesses in the process. Through such research, promote development of ideas and recommendations that have potential to improve production management policy, procedures, and practices.

Background: In general, production is the transformation of resources into goods and services that satisfy needs and requirements of a particular consumer or segment of the consumer market. Production management is the art and science of planning and efficiently managing economical integration of resources and processes to satisfy

such needs and requirements on schedule with due consideration to consumer satisfaction. As a practice, production management is a blend of operations research, economics, industrial engineering, and behavioral science. Production management is one of the oldest industrial functions; however, as a function in the Air Force acquisition environment, it has been ill-understood by many acquisition managers. During the last twenty-five years, much has been accomplished in the area of research relative to models and quantitative methods, but application of the research results has been slow and tedious. Current changes in the acquisition environment should provide opportunities to apply these models and methods along with newer and hopefully better approaches.

Significance: As a weapon system evolves and moves through its life cycle, change is an environmental fact. Production concerns during the acquisition cycle include strategy formulation and planning for realistic production/manufacturing objectives and assurance that these objectives are achieved. As a weapon system program progresses through different phases, there is a need to shift emphasis given to the production/manufacturing aspects of the weapon system; management of the productive system has to keep pace with the weapon system program.

The challenge of research in this area is to provide management with knowledge and techniques that improve strategy formulation and planning processes that are relevant to the decisions required to develop, produce, and support weapon systems that meet cost, schedule, and quality requirements.

Projects Completed(\*)/In Progress:

\*1. Project Number B-2-3-75. "A Comparative Analysis of the Application of Production Readiness Reviews," Captains Donald E. Brechtel and Steven C. Lathrop. AFIT/LS Thesis. Chairman: Lieutenant Colonel M. D. Martin.

a. Summary: The purpose of Production Readiness Reviews (PRRs) is to assure readiness for economical and efficient production. The objectives of this research effort were to identify differences between completed PRRs and to determine the feasibility of a standard PRR approach to assess a contractor's readiness for transition into production. The researchers evaluated PRRs conducted on the F-15, A-10, and Airborne Warning Control System (AWACS) programs relative to the Defense Acquisition Review Council (DSARC) decision cycle. The study

includes findings relative to application of readiness criteria outlined in Air Force Systems Command Regulation (AFSCR) 84-2 by the different program offices and recommendations on how and when to apply the criteria. The approach proposed should help managers improve their planning baseline for phasing reviews during development and minimize uncertainties concerning readiness.

b. Significance: Policy and guidance at DOD are currently being developed to require PRRs on all major defense programs. The concept of a PRR is designed to insure that the decision for full commitment to production is made after proper planning and preparation for quantity production.

\*2. Project Number B-2-2-75. "An Investigation of Changes in Direct Labor Requirements Resulting from Changes in Airframe Production Rate," Lieutenant Colonel Larry L. Smith. AFIT/CID Dissertation. University of Oregon. Chairman: Dr. R. J. Sampson.

a. Summary: The objective of this research effort was to develop a procedure to estimate the effect of a production rate change on airframe direct labor requirements. The researcher examined all available literature and methods for estimating direct labor, including previous research findings. Based on this evaluation, the researcher developed a model for estimating the effect of changes in production rates on airframe direct labor requirements. The model was tested against actual data from three programs for validity as an estimating tool for airframe direct labor hours. It proved successful and indicated that there is a measurable relationship between production rates and airframe direct labor hours. These tests were conducted using different levels of data: both fabrication and assembly labor categories.

b. Significance: The model proposed by this researcher provides a potential estimating tool to forecast changes in resource requirements for change in airframe production.



Projects Completed(\*)/In Progress:

\*1. Project Number B-4-5-77. "Program Manager Information Requirements," Major Craig E. McComb, Air Command and Staff College.

a. Summary: An Air Force Systems Command program manager must insure that he is provided with good management information for decision-making. This paper provides a concept for guiding program management through the various steps necessary to create an information system. Seventeen categories of information were examined relative to each phase of a program life cycle. Conclusions emphasize the importance of planning and structuring the program manager's information system.

b. Significance: This study provides a structured approach to assist the program manager in developing a system for collecting and maintaining program information.

Research Opportunities:

a. Examine MIS literature and research results for methods that may apply to Air Force problems.

b. Develop a common set of terms to improve the communication between designer and user.

DESIGN-TO-COST

Area Manager: Major Lyle W. Lockwood

Objective: To improve the application of Design-to-Cost concepts.

Background: The objective of Design-to-Cost is to maximize system performance subject to a given cost constraint (or cost target) with stated quantity and schedule requirements. The establishment of the cost target is done early in the acquisition process and requires trade-offs among cost, performance, schedule, and quantities for alternative system design concepts and alternative preliminary designs. The resulting cost target may be either: (1) a design to unit

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production cost target based upon stated production quantities, or (2) a Design-to-Life cycle cost target based upon stated operational life cycle cost elements-- development, production, operation, and support. The latter requires the use of Life Cycle Costing technology, sciences, and arts. The application of Design-to-Cost concepts takes place both within acquisition agencies and contractors and between them through the negotiation and program/contract management process. The Design-to-Cost concept is based upon sound economic and business management theory; however, research is needed to identify appropriate application methodologies in order to narrow the gap between theory and practice.

Projects Completed(\*)/In Progress:

\*1. Project Number B-5-1-75. "Applicability of Design-to-Cost to Simulator Acquisition" (SLSR 36-76A), Major Kaleem Hazer, Jr., US Army, and Major Daniel L. Ringlu, USAF. Research Director: Lieutenant Colonel John R. Adams.

a. Summary: The objectives of this project were to determine the applicability of Design-to-Cost criteria to the acquisition of aircraft simulators and to identify major problems in the application of the Design-to-Cost concept. The study validated 25 decision criteria applicable to the use of Design-to-Cost. Validation was accomplished through a content analysis of the literature and interview with 17 program management personnel experienced in the use of Design-to-Cost. Program management personnel from the Simulator SPO then evaluated these characteristics. Fifteen were found to be applicable to simulator acquisition, six had marginal applicability, and four were found to be not applicable. On this point, the study concludes that Design-to-Cost is not generally applicable to simulator acquisition when "normally competitive commercial" technology is involved and may be applicable to extensive production runs or design requiring advanced technology not normally found in the market.

Pertinent to the second objective--to identify major problems in the Design-to-Cost concept--the study concludes that a great deal of uncertainty exists in the implementation of the Design-to-Cost concept. More specific problems identified in the study were: (1) Design-to-Cost goal rationale is not widely documented and communicated as a baseline, (2) program managers

measured on acquisition cost performance unless a "very strong case to present" for lower Life Cycle Costs, (3) there are weaknesses in the Management Information System for recording and measuring Life Cycle Costs, (4) Congressional involvement in revising budgeting and programming parameters are counterproductive to the achievement of lower Life Cycle Costs, (5) Design-to-Cost concepts are not used by prime contractors when dealing with subcontractors, and (6) Double-digit inflation has "played havoc" with Design-to-Cost goals.

LOGISTICS: Processes of supporting the systems in the operating inventory.

#### INDUSTRIAL BASE

Area Manager: Captain Paul W. Gross, Jr.

Objective: To maintain appropriate and efficient industrial capability consistent with current and projected national defense requirements.

Background: The ability of the industrial base to support the DOD requirements is an important aspect of national defense. An improved understanding of the character and extent of the Defense Departments' requirements for the national industrial base is needed. Research in this area can be directed into several basic dimensions: (1) industrial production capability, and (2) materiel resource requirements for national defense purposes. The industrial production capability is concerned with research/development, plant/equipment, and manpower (skill and training) capabilities of industry to meet DOD requirements. DOD policies and practices relating to industrial reserve facilities, Government-furnished property, Government-owned/contractor-operated facilities, and industrial preparedness planning are of specific interest. The materiel resource dimension is concerned with identifying and assessing potential shortages of raw materials and energy resources required for the production and operation of military equipment and actions that could help alleviate such problems.



Projects Completed(\*)/In Progress:

1. Project Number D-2-3-77. "Microwave Tube Industry Assessment 1976-1985," Ken Garoff, Palisades Institute for Research Services, U.S. Navy contract.

a. Summary: The U.S. military electronics system will continue to rely on microwave tubes during the next decade. Therefore, a competitive microwave tube industry is essential for our future defense posture. Apparently, recent trends in the microwave tube industry raise serious questions regarding the industry's ability to meet defense needs. The research is attempting to: (1) identify the critical skills, resources, and technology required to allow the industry to operate economically and competitively; (2) evaluate the present individual and collective status of the industry including the trends, strengths, magnitude of R&D, new technology, material availability, and staffing impact upon production; and (3) project future capability in the industry and its impact upon the DOD. The Air Force assisted in providing data to this Navy contract which should be completed by June 1977.

2. Project Number D-2-4-77. "An Economic Analysis of a Government-Sponsored, Commercial Convertible Aircraft," Captain Robert J. Morgan and Second Lieutenant Stanley L. Mead. AFIT/LS Thesis. Chairman: Captain Joel B. Knowles.

a. Summary: National war contingency plans depend heavily on strategic airlift. As a blend of military and Civil Reserve Air Fleet (CRAF) aircraft, the National Strategic Airlift Resource capability is insufficient to meet strategic airlift requirements. The CRAF capability is seriously degraded due to the inability of wide-bodied aircraft to transport oversized military cargo. Funds for an \$800 million program for modifying CRAF wide-bodied passenger aircraft to a convertible (passenger/freight) configuration have been disapproved by Congress for the past three consecutive years. This research undertakes an examination of an alternative course of action proposed by previous studies; namely, Government sponsorship of the initial difference in cost between a convertible and passenger wide-bodied commercial aircraft, as well as recurring costs. An economic analysis is conducted with the aid of a computer to ascertain: (1) the time interval over which the equivalent capability of 100 wide-bodied freighter aircraft would be phased into the commercial carrier fleet given a specified percentage increase in average annual deflated Gross National Product, and (2) the impact of reimbursement by the commercial air carriers of initial Government

sponsorship costs whenever a convertible aircraft's cargo configuration is used to generate revenue. The expected completion for the research is September 1977.

#### QUALITY ASSURANCE

Area Manager: Major Lyle W. Lockwood

Objective: To identify quality assurance methodologies that effectively and economically contribute to customer satisfaction in the acquisition/procurement environment.

Background: With the exception of needs having to do with quantity and location, the satisfaction of customer needs is the objective of acquisition quality assurance. In a military environment, this satisfaction contributes directly to force readiness and ultimately to mission effectiveness. In a broad context, two dimensions of quality that contribute to customer satisfaction are design quality and conformance quality. In system acquisition, design quality is normally achieved through the research, development, test, and engineering (RDT&E) process.

Supplementing the RDT&E process and continuing through the disposal phase of a weapon system is the traditional application of quality assurance which includes the use of quality control and inspection techniques concentrating upon conformance quality. Measures of quality over extended time periods are accomplished through reliability disciplines. Although basic procurement quality assurance policies are prescribed by the Armed Services Procurement Regulation and functional directives, the approaches/strategies for quality assurance used by acquisition managers vary depending upon the nature of the procurement.

Typical categories of procurements are: (1) RDT&E of major weapon systems, (2) production of major weapon systems, (3) replenishment procurement of major subsystem, (4) replenishment procurement of components and pieceparts, (5) renewal, modification, or refurbishment of major systems/subsystems, and (6) the procurement of services and support functions. In any selected acquisition environment, six primary elements of acquisition quality assurance need to be balanced: (1) the management of internal quality assurance programs and resources-- staff, program office, contract administration office,

and maintenance; (2) the selection of contract quality requirements--product and management; (3) managing interface disciplines--reliability, system safety, manufacturing, configuration management, etc.; (4) the evaluation of supplier/contractor performance; (5) the measurement of customer, i.e., using command, satisfaction; and (6) the acceptance of products/services including the identification of critical characteristics which require direct government inspection/verification.

**Significance:** Unacceptable quality levels of products delivered to our operational forces decrease our military readiness posture and the ability to achieve desired levels of mission effectiveness. Unacceptable items that are detected increase demands upon procurement for resupply, increase operation and support costs, and add unnecessary transportation costs. Unacceptable items that are in the inventory and supply system give false indications of reserves that are ready for use. Unacceptable levels of scrap, rework, and repair; reinspection; and correction costs incurred throughout the production/management processes of contractors are nonproductive costs which contribute to higher acquisition costs and place additional strains upon limited procurement funds. Correction costs during the operation phase divert resources from readiness objectives. Appropriate acquisition quality assurance methodologies are required to minimize the above costs and increase our readiness posture.

Projects Completed(\*)/In Progress:

\*1. Project Number D-4-1-76. "An Investigation of the DCAS Management Information System as a Source of Information for Allocation of Procurement Quality Assurance Manpower Resources" (SLSR 6-76A), Captains Louis R. Albani, William J. Manley, Roger A. Sindle. AFIT School of Systems and Logistics. Research Director: Lieutenant Colonel Stephen E. Barndt.

**Summary:** This study identified eight factors which can be used by a Quality Assurance Representative/Manager to predict the number of corrective action hours to be expended on a given contract. Corrective action hours are an indicator of the number of deficiencies in a contractor's products, quality program or inspection system. The desirable objective is to allocate Government quality assurance manpower to quality assurance activities which will reduce the number of hours required for corrective action. The study suggested that eight factors (or variables) could be used to predict, i.e., control, the amount



of corrective action hours. These were: (1) the type of commodity, (2) the quality provision of the contract, (3) the contract dollar value, (4) the type of facility, (5) system surveillance time, (6) product verification time, (7) quality concepts and planning, and (8) number of visits to the facility. The use of the model developed should assist the quality assurance manager to allocate resources to activities which will reduce the need for corrective action hours.

\*2. Project Number D-4-2-76. "An Appraisal of Selected Findings of Quality Deficiency Reports for Items in the 59 Federal Stock Group (Electrical and Electronic Parts)" (SLSR 33-76B), Thomas W. Waller, Captain Arnold L. Weinnan. AFIT School of Systems and Logistics. Research Director: Major Edward Karnasiewicz.

Summary: This project was an analysis of causes of failures in electrical and electronic parts (59 Federal Stock Group) reported on quality deficiency reports (QDR) under AFR 74-6. A sample of 319 QDRs from approximately 2,000 QDR's processed against the 59 Federal Stock Group were analyzed. Twenty-three district causes of failure were identified. Manufacturer-related defects accounted for 53% of the causes, and in 15% of the cases no quality defect was found. Supply-related defects accounted for 9% of the causes, and maintenance actions accounted for 8%.

The study concludes that although the QDR system is oriented to identify material deficiencies, the results of the QDR analysis can be used to draw implications about other aspects of the logistics system. Further, the study points out that 25% of the QDRs were incorrect, misrouted, and involved nondefective parts. The study made several recommendations for the improvement of the QDR system.

\*3. Project Number D-4-3-76. "Criteria for Predicting Manpower Required for the AFPRO Contractor Quality Assurance Function" (SLSR 41-76B), Lyman K. Barney, Captain David W. Carpenter, Olen D. Samuels, Jr. AFIT School of Systems and Logistics. Research Director: Major Leslie J. Zambo.

Summary: AFCMD AFPRO Quality Assurance (QA) manpower models are based upon the number of contractor QA personnel. This study developed a contractor QA personnel manning model. Factors, i.e., variables, selected were dollar value of contract, the quantity of production and spares contracts, and the quantity of Material Review Board actions. The value of this study is two-fold: (1) to evaluate/predict the number of contractors QA personnel for new contracts, and (2) to evaluate AFPRO QA manning levels.

Research Opportunities:

- a. Does the Air Force have an effective system to measure quality/customer satisfaction? Are the right measures used? Do the right decision makers receive the information?
- b. What are reasonable levels of rework, repair, scrap, and reinspection costs? Are there different levels for aircraft, missiles, avionics, engines, etc.?
- c. What are appropriate contract incentives for quality? Are warranties cost effective? How should procurement quality assurance be adjusted if contract incentives, warranties, or reliability improvement warranties are used?
- d. What quality assurance data should acquisition program managers review to evaluate quality performance?
- e. How should quality assurance interface with other disciplines to provide an economical, effective acquisition quality program?
- f. How should Air Force quality assurance resources be allocated to optimize costs, benefits among defect prevention, defect detection, and defect correction activities?
- g. What criteria/techniques should be used to identify critical characteristics/processes for special monitoring by program quality assurance managers? How can existing engineering disciplines such as the hazard analysis by system safety engineers or failure mode effects analysis by reliability engineers be used to identify critical quality characteristics?

BUSINESS ENVIRONMENT. Those aspects of our procurement/acquisition process which are designed to permit us to accommodate conditions which arise externally and over which we have no direct control.

INFLATION

Area Manager: Captain Ray E. Fellows

Objective: Develop improved contractual methods and facilitate program budgeting techniques, effective planning,

and procurement of supplies and services during periods of rapidly changing price levels.

Background: Air Force procurement officers are responsible for providing support of the defense mission through effective contracting methods. In today's economy, it has become increasingly difficult to meet mission support requirements while supporting stated Governmental policy of encouraging fair profits and economic growth. Inflation problems in both the planning process and the procurement process must be managed more effectively by the Air Force. Since current budgeting and contracting methods may not adequately deal with rapidly escalating prices, different approaches need to be developed. Within the inflation area spectrum, four interest areas have been identified: (1) the economics of inflation, including its causes and the prediction of inflation rates; (2) the development, usage, and effects of Economic Price Adjustment (EPA) clauses; (3) the development and use of price indices, and (4) payment policy under terms of EPA clauses.

Significance: In March 1974 the Armed Services Procurement Regulation (ASPR) policy concerning EPA clauses was changed. EPA clauses have been included in a number of contracts awarded since then. Some of these contracts are now beginning to require adjustments under these EPA clauses. Initial surveys of EPA adjustment experience indicates that methods of applying the EPA adjustment to contract targets and billing prices vary widely. Research is needed to permit development of a consistent, efficient policy in this area. Also problems are being encountered in consistently estimating the impact of inflation during major system acquisition planning. This is particularly true when comparing independent system program cost estimates. Research in the area of inflation can lead to more consistent approaches to measuring its impact on system acquisition.

Projects Completed(\*)/In Progress:

\*1. Project Number E-1-13-77. "Evaluation of Economic Price Adjustment (EPA) Clauses in Air Force Contracts," Kenneth M. Gaver and Martin S. Geisel. The Graduate School of Management, The University of Rochester, Rochester, New York.

a. Summary: This research involved three phases of study. First, the researcher developed an evaluation plan



by reviewing various EPA clauses being used in current U.S. Air Force contracts. The relevant clause evaluation factors are described, and their use in the evaluation is discussed. The second phase of the study deals directly with the evaluation criteria or factors determined to be necessary to evaluate the construction of EPA clauses. This phase of the study presents the authors' argument for considering four factors when structuring an EPA clause. The third phase of the study is the analysis of 31 EPA clauses using the previously established criteria. In this phase of the study, the researchers discuss the nature of EPA clauses and suggest why they may be demanded by both the Government and the contractor. The index method of price adjustment is explained in detail and is followed by an analysis of four forecasting models. The results of this forecasting model analysis are presented, and a recommended forecasting model is suggested. The relationship between the level of index aggregation and the predictability of the index is explained, and an analysis of the predictability is accomplished.

b. Significance: The analysis documents the finding that EPA clauses in Air Force contracts vary widely with respect to coverage, complexity, construction, and implementation. Detailed analysis provides a much greater understanding of the problems resulting from the above differences. Evaluation of the clause structure was based on four general criteria developed by the researchers. These included:

- (1) the protection of the contractor against price changes beyond his control,
- (2) the insurance against overcompensation of the contractor during contract performance,
- (3) the use of the best available forecast as to the most likely course of input prices, and
- (4) the simplicity and ease of implementation of the clause.

The compound percentage method of adjustment, which involves increasing a single index by a fixed percentage amount per unit of time, was found to be the most appropriate for Air Force contracting. As a result of this finding, the researchers conducted a detailed analysis of the six general parameters considered when constructing an index-based compound percentage method of projection clause. The six general parameters investigated were:

- (1) the choice of indices,
- (2) the choice of base period,
- (3) the method of projection,
- (4) the timing of the adjustment,
- (5) the estimate of the true price level at adjustment, and
- (6) the determination of the magnitude of the threshold.

Emphasis was placed on the role of forecasting in the index method of adjustment. The log linear forecasting model, which yields forecasts equivalent to those generated by the compound percentage method of projection, outperformed the other three models tested. The following recommendations should be carefully considered when constructing an index-based compound percentage method of projection EPA clause. To determine what percentage rate of increase to use in extrapolating the index, the researchers recommend that an analysis of the index construction be conducted. Existing percentage rates of increase were found to vary greatly across indices. Two alternatives are provided for determining the percentage rate of increase. First, the rate can be determined by computing the average of each month's (year's) rate of increase exhibited in the base period data. Secondly, given easy access to computing facilities and the widespread availability of user-oriented software, one can fit the log linear model using regression to obtain an estimate of the percentage rate of increase. Both of these procedures are preferable to using some arbitrary percentage rate. In some cases, determination of the base period was found to be inconsistent and inappropriate. The base period should be long enough to provide reliable information but not too long because the properties of the indices were found to vary over time. The researchers recommend that monthly data be used from a period of not more than three or four years prior to the date of the contract award. Another problem is that of determining how far to project the index into the future. One year from the date of the contract award is the maximum period recommended by the study. The time of adjustment should be closely related to the method used to measure the contractor's time input price level. This should be estimated by using either the actual price at time of adjustment if available or an average of three index values prior to the time of adjustment. Inappropriate projection creates additional work and can subvert the

original intent of the EPA clause. The study found that the use of a threshold to determine whether an adjustment should be made was of little consequence to the overall outcome of the contract. Use of a threshold to determine whether an adjustment in price should be made occurred on some clauses. A threshold value of one to two percent is not considered unreasonable by the researchers, but the benefits of using this technique may not justify the cost of training contract administrators to implement it. The analysis of index aggregation (the combining of several specific indices to form another index) indicated that a highly aggregated index is much easier to predict than the less aggregated index. However, the difficulty of representing the input prices of a contractor with an aggregated index sometimes makes it necessary to use non-aggregated indices. A trade-off must be made between predictability and accuracy of representing the input price of the contractor. In the end, this must be resolved through negotiations. Price analysts and contracting officers who have the responsibility of designing and administering these clauses in contracts should find this analysis very useful. The findings should also be useful to individuals involved in policy formulation.

\*2. Project Number E-1-7-76. "Cost of Capital Forecasting Model For Interim DOD CAS 409," Lieutenant Colonel John S. Brush, Frank J. Seiler Research Laboratory, USAF Academy, Colorado.

Summary: This forecasting model predicts future levels of the Moody Baa long-term interest rate one, two, and three years into the future. The model is consistent with conventional economic theory and utilizes well-known techniques of time series analysis. New estimates over a three year future horizon can be made at the end of each quarter. The model has fitted errors smaller than those produced by simple trend projection models.

\*3. Project Number E-1-11-76. "Five-Year Inflation Forecasts For Selected NATO Countries," Lieutenant Colonel John S. Brush, Frank J. Seiler Research Laboratory, USAF Academy, Colorado.

Summary: This study extends the inflation forecasting techniques described in "A Disequilibrium Adjustment Inflation Forecasting Model" (USAF-TR-75-4) to five NATO countries: Germany, Belgium, the Netherlands, Denmark, and Norway. Equations were developed to forecast two years into the future using fundamental economic data. Non-judgmental forecasts of longer horizons are made using linking equations. All equations and accompanying



statistical information are included herein along with forecasts of the rate of inflation in each country out to mid-1980. Quarterly updates of these forecasts can be made.

\*4. Project Number E-1-10-76. "Alternative Forecasting Techniques For the DOD O&M (Purchases) Index," Lieutenant Colonel John S. Brush. Frank J. Seiler Research Laboratory, USAF Academy, Colorado.

Summary: This study develops four forecasting equations tailored to the problem of forecasting the DOD Operation and Maintenance (O&M) (purchases) Index. Ranging from simple trend projection equations to models requiring forecasts of the Gross National Product (GNP) deflator and the Wholesale Price Index (WPI) deflator, these equations are used to generate almost a dozen alternate forecasts of O&M inflation. Error bands of forecasts are discussed and internal consistency of the current OSD O&M projection is analyzed.

\*5. Project Number E-1-9-76. "An Inflation Forecasting Model Exhibiting Multinational Applicability," Lieutenant Colonel John S. Brush. Frank J. Seiler Research Laboratory, USAF Academy, Colorado.

Summary: A modeling methodology based on a combination of Box-Jenkins techniques and an approximation method for identifying structure in the presence of auto and joint-correlation are presented and used to develop money supply based inflation forecasting models for Germany, the United States, Japan, France, Belgium, Italy, Denmark, and the Netherlands.

One-year lags for both past prices and past money supply changes are found to be adequate using both the proposed methodology and an overfitting test. Similarities and differences in the dynamics, steady state rates, and effectiveness of monetary policy are examined. Forecasts for the period mid-1976 to mid-1977 are presented.

\*6. Project Number E-1-8-76. "Study of Possible Improvements in the Accuracy of Aeronautical Economic Escalation Indices," Lieutenant Colonel John S. Brush. Frank J. Seiler Research Laboratory, USAF Academy, Colorado.

Summary: Taking as given the existing definitions of cost indices for airframe, frame, avionics, and engine development and production, this study explores three aspects of the problem of forecasting these indices: the appropriateness of linking these six indices to the GNP

inflation; the possibility of improving the forecasting accuracy of those six indices by alternative equation formulation; and the propagation of forecasting error from the basic equation formulation, as well as from errors in the GNP forecasts.

The study is organized into sub-sections addressing the three aspects just listed and ends with a summary. Additional efforts on this study will be accomplished in mid-1977.

7. Project Number E-1-6-77. "A-10 Inflation Study - Economic Adjustment of Depreciation," Major Joseph V. Fairchild, Jr., USAFR. Nicholls State University, Thibodaux, Louisiana. AFBRMC Sponsored. Research Assistant: Captain Ray Fellows.

Summary: This research project will seek to determine the approximate effect of implementation of an economic adjustment to depreciation on the A-10 aircraft production program.

Research Opportunities:

a. The impact of inflation on a particular contractor is complex and of great interest to the procurement community. A method of evaluating and determining this impact is needed.

b. Payments on contracts containing EPA clauses are being made and a consistent policy concerning these payments needs to be established. Research that would lead to policy improvement and better understanding of these payment aspects is needed.

c. Proper selection of price indices is necessary to properly forecast price escalation. More research is needed to develop improved methods of indices selection for particular procurement actions.

d. Should EPA clauses be used is a question often faced by Air Force managers. A decision matrix is needed to determine the appropriateness of the use of EPA clauses on a given procurement.

## IMPACT OF SOCIO-ECONOMIC PROGRAMS

Area Manager: Captain Ray E. Fellows

Objective: To analyze the socio-economic aspects of DOD procurement, with particular attention to the impact of socio-economic and special interest programs on the DOD budget.

Background: Quantitative analysis is meager in studies concerning the additional cost and/or time required to comply with laws and executive orders that pertain to various socio-economic objectives not directly related to the military mission of the Air Force. Development of figures associated with the support of such programs would assist the Air Force in determining the net mission-related purchasing power of fiscal year budget dollars. In this regard, methodology to be used in the study of socio-economic programs must be addressed. Specifically, obtaining accurate data on man-hours expended, costing administrative effort and/or delay, and devising a method of keeping current on actual prevailing local usage rates (as opposed to Department of Labor furnished rates) are subjects requiring research. The specific socio-economic programs involved are:

- a. Small Business Set Asides.
- b. Section 8(a) Awards.
- c. Davis-Bacon Act.
- d. Service Contract Act.
- e. Equal Employment Opportunity.
- f. Labor Surplus Set Asides.
- g. Buy American Act.
- h. Balance of Payments Program.

Significance: All levels of Air Force management need a better understanding of the nature of socio-economic programs. Their impact on the Air Force procurement process is significant. The nature of this impact needs to be clearly understood. Research in this area is addressing



this need. Methods are being developed to measure the impact of socio-economic programs. The benefits and the costs of these programs are being studied. The results of this research will lead to more efficient management of the Air Force procurement process.

Projects Completed(\*)/In Progress:

\*1. Project Number E-2-4-76. "The Relationships Between Socio-Economic Programs and the Department of the Air Force Budget: Section 8(a) of the Small Business Act--The Economic Development and Public Finance Aspects of a Public Policy Program," Major Arthur T. King, University of Colorado. Research Director: Professor Ragali El Mallakh.

a. Summary: The overall objective of this dissertation is to measure the economic impact of the Section 8(a) socio-economic program. The author develops a methodology to measure the economic impact of the program and then applies the methodology. The data base used was limited to Air Force contract data. In addition to measuring the economic impact of the Section 8(a) program, the author also develops a cost model and measures the cost to the Air Force of administering the program.

b. Significance: This research represents a good first step toward developing a general methodology to measure the impact of socio-economic programs. It also addresses the problem of measuring the costs of administering these type programs and thus establishes a means of determining the effectiveness of a socio-economic program. The study also includes an exhaustive bibliography of the socio-economic area of study.

\*2. Project Number E-2-5-76. "Impact of Socio-Economic Programs on DOD Procurement Cost as Perceived by Procurement Personnel," Lieutenant Colonel Daniel L. Babcock, USAFR, Ph.D., University of Missouri-Rolla. AFBRMC-Sponsored. Research Assistant: Captain R. Fellows.

Summary: Selected DOD procurement personnel were interviewed to obtain their perceptions of the comparative impact on DOD procurement cost of 39 socio-economic programs listed by the Commission on Government Procurement. Personnel interviewed were from the Defense Contract Administration Services Region-St. Louis, the AF Plant Representative Office at McDonnell-Douglas Corporation, base

procurement offices at Fort Leonard Wood, MO and Kirtland AFB, NM, and the AF Contract Management Division. The principal programs perceived to have cost impact were Small Business Administration Section 8(a) subcontracts, equal opportunity administrative costs, and Service Contract Act and Davis-Bacon Act influence in wages.

\*3. Project Number E-2-3-76. "Non-quantitative Disincentives to Air Force Procurements: An Exploratory Analysis," Captain Peter Dineen, AFIT/CID, University of Texas.

a. Summary: The primary objective of this study was to consolidate information on socio-economic programs that affect the allocation of resources within the DOD. Eight specific programs are identified as directly affecting the DOD procurement process, through the issuance of standard contract clauses in contracts for goods and services. The origin and purpose of each of the eight programs, along with the major provisions for implementing the program, are discussed. In some cases, the impact of these programs on the allocation of resources within the DOD is discussed. The real need for quantitative data is verified and this need limits the researcher's efforts to evaluate the programs from a costs/benefits standpoint. Secondly, this study attempts to evaluate the impact of socio-economic programs on one U.S. Air Force contract and compare the results of this evaluation to a previous study. Only limited quantitative information resulted from this portion of the study; however, numerous weaknesses in the present system of implementing these programs, as well as inconsistencies in some of the programs, were discovered and discussed.

b. Significance: This consolidation of information should assist further research efforts in this area by providing a point from which research may be started. Some of the weaknesses and inconsistencies of socio-economic programs discussed in this study may be of use to support changes to the present structure of socio-economic programs and the present methods of implementation.

Research Opportunities:

a. Evaluation of socio-economic programs to determine their costs/benefits is very difficult. Methods to evaluate and verify these costs/benefits need to be developed and applied to present programs.

b. The direct impact of socio-economic programs on the Air Force budget is unknown. This aspect of socio-economic programs needs further study.

c. Contract administration of socio-economic programs is difficult. Studies are needed to define the tasks of complying with socio-economic program requirements at the contract administration level and evaluate the effectiveness of the contract administration relative to these program requirements.

d. The "opportunity cost" aspect of implementing socio-economic programs in the DOD procurement process is unknown. Research to determine the opportunity cost of these types of procurement actions would increase understanding of the impact of socio-economic programs on DOD procurement.

e. Contract disputes and defaults occur on contracts that involve socio-economic program constraints. These disputes and defaults need to be analyzed to determine their causes and minimize future impact of such disputes.

f. Adequate data/information to conduct meaningful research in the socio-economic area is very scarce. Research to establish a useful data base and an on-going management information system to monitor the measure of the impact of these programs is needed.



PART II

U.S. AIR FORCE ACADEMY RESEARCH

U.S. AIR FORCE ACADEMY RESEARCH

Objective: To provide an interface between users and researchers.

Background: A number of problems faced by procurement/acquisition personnel can be studied in an academic environment. Highly qualified researchers on the faculty of the Department of Economics, Geography, and Management possess skills needed to address these problems. In recent years, we have found it a very valuable teaching tool to structure procurement/acquisition problems so that they can be studied by cadets as part of their regular curriculum. At the same time, a number of faculty members have become interested in solving some of the more complex problems. The following projects and research activities were performed during 1976. They represent a broad spectrum of activity and are indicative of the breadth of capability and interest available on the Department of Economics, Geography, and Management faculty. Requests for reports or additional information should be directed to:

Director  
USAF Procurement Research Office/DFEGM  
USAF Academy, Colorado 80840

Projects:

Major Leonard E. Berry

"Accounting Power, the Political Element and the Cost Accounting Standards Board"

Government Accountable Journal, Summer Issue, 1976.

The article discussed the concepts of power and politics in setting accounting standards in the public and private sector. It also argued that the establishment of the Cost Accounting Standards Board was an exercise of political power in the public sector and showed the impact of this on setting standards in the private sector.

Lieutenant Colonel Leslie G. Denend

"An Economic Investigation of Expected Returns Across Occupations in the U.S. Non-Supervisory Labor Force"

Ph.D. dissertation

In our society where markets exist, generally risk is not borne without compensation. This proposition is substantiated for 65 broad occupational categories in the non-supervisory U.S. labor force. Tests are performed using BLS and census data. After controlling for education and experience, the relative uncertainty of future earnings does make a difference in expected earnings. Implications for public sector earnings based on comparability are explored.

Major Gregory G. Hildebrandt

"Performance Incentives Versus Prices Versus Quantities"

Econometric Research Program Research Memorandum Number 204, October 1976 and USAFA-TR-76-23, USAF Academy Technical Report, December 1976.

Co-author: Laura D'Andrea Tyson, Assistant Professor, Princeton University

There is an analysis of the degree to which performance incentives, prices, or prescribed quantities achieve allocative efficiency. When one good is being controlled, it is proved that a performance incentive function can be constructed which achieves the center's objective and yet which does not require any knowledge by the center of the producer's cost function. The second-best solution achieved with performance incentives when more than one good is being controlled is also discussed.

"The U.S. Versus the Soviet Incentive Models"

USAFA-TR-76-21, USAF Academy Technical Report, December 1976

Published in Proceedings of the Fifth Annual Department of Defense Procurement Research Symposium at the Naval Postgraduate School, 17-19 November 1976.

There is a discussion and analysis of the actual use of performance incentives in the Soviet Union and the United States. The Soviets have recently introduced an incentive program to motivate state enterprises to select the socially optimal output level, and this system is compared with the use of performance incentives by the U.S. government to



reward private producers in accordance with cost and performance outcomes. It is also shown that the U.S. incentive system can be extended to solve the target output selection problem.

"Performance Incentives and Planning Under Uncertainty"

Princeton University Econometric Research Program  
Research Memorandum Number 201, July 1976 and USAFA-  
TR-76-16, USAF Academy Technical Report, September  
1976.

The use of the performance incentive function by planning organizations when there is subjective or objective uncertainty is discussed. It is proved that a performance incentive function can be constructed which achieves both allocational and distributional optimality, when there is subjective uncertainty about the conditions of production and both the center and the producer are risk adverse. When there is objective uncertainty, however, it is shown that it is not, in general, possible for the center to achieve these two objectives simultaneously.

Major Robert L. Taylor

"A Conceptual Model for Evaluating Contractor Management During Source Selection"

Proceedings of the Fifth Annual Department of Defense Procurement Research Symposium (Monterey: Naval Postgraduate School), November 1976, pp. 1-50. USAFA-TR-76-6, USAF Academy Technical Report, March 1976.

This report provides the reader with a conceptual model for evaluating a contractor's management potential during source selection. The model is not a definitive outline of what must be done; rather, a discussion of a number of the variables that ought to be considered. The reader can then include only those variables most relevant to the task at hand. The model, then, should be viewed as a thought-triggering device for source selection panels to define and structure contractor management evaluation during the source selection process. The evaluation of contractor management is divided into three major functional areas: planning, organizing, and controlling. A checklist of variables under each topic is included in the report, with examples of a numerical scoring system. The

report concludes with a detailed example of a complete source selection numerical scoring system, including technical, cost, management, quality, reliability, experience, facilities, and contract evaluations. This report should be invaluable to organizations entering into source selection.

"The Use of Statistical Sampling in Contract Pricing"

USAFA-TR-76-17, USAF Academy Technical Report,  
August 1976

Co-author: Captain Harry Utter

This report provides the reader with the results of a study on the use of statistical sampling techniques on pricing cases in one Air Force Plant Representatives Office (AFPRO). The study reveals that 38% of the AFPRO pricing workload is devoted to 1-1/2% of the contractual dollars and that 77% of the workload is devoted to 11% of the dollars proposed. This study was undertaken to help the AFPROs concentrate their skilled manpower on the large dollar proposals by using statistical sampling on backlog proposals under \$100,000. Data was collected at one AFPRO for all pricing cases for a three-year period, and sampling variations (sample sizes, dollar magnitude, etc.) were tested to determine the feasibility of the concept and the appropriate sample size and dollar limitations. The report concludes that for the subject AFPRO, using 25% sample size of backlogged cases less than \$100,000, the analyst can be highly confident that the average percentage reduction recommended for the sample does not statistically differ from the reduction with 100% pricing. Additional data were collected to test the 25%, \$100,000 conclusion, and the results supported the initial finding. This report should prove to be invaluable for AFPRO and Defense Contract Administrative Services (DCAS) offices doing repetitive pricing from the same contractor under backlog conditions.

"Hahn, Inc. (A) and (B)"

Dalrymple, D.J. and L.J. Parsons, Marketing Management: Text and Cases (New York: Wiley) 1976, pp. 619-631.

Co-author: James M. Utterback, Harvard University

This comprehensive case study of an actual company, chronicles the firm from the time it is formed until 1973. Rapid growth and technological change challenge Lloyd Hahn who, as president of the firm, struggles to maintain control. Agricultural sprayers, tillers, and lawn mowers comprise the product line. A FORTRAN computer program accompanies the case to assist the student in studying alternative marketing strategies during the period.

"A View of Performance Appraisal from Organizations Using It"

Personnel Journal, June 1976, pp. 290-299.

Co-author: Robert A. Zawacki, University of Colorado, Colorado Springs.

This report presents some findings from a survey of industrial performance appraisal systems. We do not find that an overwhelming number of organizations have turned to the collaborative approach; we do find that 15 percent of the respondents plan a change in the coming year, and by and large they plan to employ a more collaborative approach. The findings indicate that management is generally satisfied with their performance appraisal systems and believe the systems have contributed toward more positive employee attitudes and performance. There appears to be no relationship between the size of the organization and the type of system used. Thus, in the area of performance appraisal it does not seem that larger organizations are changing from traditional to collaborative systems. Much depends on the existing appraisal system and corresponding management satisfaction with that system.

"1976 Proceedings of the Academy of Management"

Published by the Academy of Management, Mississippi State, Mississippi, August 1976.

Co-editors: Michael J. O'Connell, USAF Academy; Robert A. Zawacki, University of Colorado, Colorado Springs; D. D. Warrick, University of Colorado, Colorado Springs.



This book is a compilation of the 100 best papers presented at the Thirty-Sixth Annual Meeting of the Academy of Management, Kansas City, August 1976. Reporting the most current management research and theory, the book covers topics in organization theory, management education, production management, organizational behavior, social issues in management, etc., and is a valuable reference tool for scholars, libraries, and consultants.

"Estudio Longitudinal de la Comunicacion en la Investigacion: Influencias Techias y de Gestion"

Escuela Superior de Administracion y Direccion de Empresas, Barcelona, Spain, September 1976.

Co-author: James M. Utterback

Communications patterns in a research and development laboratory are studied. The effects of changes in technical assignments and work group composition do not change appreciably, the two-step flow of information into the work group. However, the study shows that it takes nearly 18 months to re-establish group networks after changes in technical assignment or group composition while the key communicators re-emerge regardless of the changes.

Major William J. Weida

"Forecasting Wage Escalation at Arnold Engineering and Development Center (AEDC)"

USAF-TN-76-2, USAF Academy Technical Note, November 1976.

Co-authors: Lt John J. Crowley and Lt Arthur L. George

An investigation into a number of alternative wage forecasting models revealed that GNP was the best predictor of future wage rates at AEDC. The GNP model, with high and low estimates of FY 77 and FY 78 GNP figures, was then used to provide wage escalation figures for the three categories of labor at AEDC.

PART III

AIR FORCE CONTRACT MANAGEMENT DIVISION RESEARCH

AIR FORCE CONTRACT MANAGEMENT DIVISION RESEARCH

Introduction

The Studies and Applications Division, Management Office, Air Force Contract Management Division (AFCMD) is responsible for developing new concepts and applying innovative techniques to improve the management of this division. The four-man office initiates internal research proposals, responds to research requests, and monitors research being conducted for AFCMD by outside resources. In addition, the Studies and Applications Division recommends and assists in the implementation of new techniques, developed through research, that will improve AFCMD's effectiveness.

The projects that follow are representative of those completed by this office in the last year or are projects that are on-going at the present time. Any questions or requests for additional information should be directed to:

AFCMD/XRR  
Kirtland AFB, New Mexico 87117  
Autovon: 964-0652

Projects:

I. COMPLETED RESEARCH:

Project: Prioritization of Contract Management Tasks (75-8).

Background: In an environment of declining manpower, the priority of the hundreds of contract management tasks takes on added significance. In the face of a manpower reduction, can AFCMD maintain the same level of task performance? Either we do all tasks at some lower average level of performance or we concentrate our remaining resources on the important tasks. The less important tasks either are accomplished at some low level of performance or are eliminated entirely. A priority ranking of the contract management tasks would identify those tasks and associated manpower which would be eliminated with minimum impact on the mission.

This priority ranking of tasks must assimilate the viewpoints of different organizations.



Clearly it is necessary to know what our customers--System Program Directors and other Government buying agencies--think are important contract management tasks.

Conclusions: This study was designed to provide AFCMD managers with some guidance in setting priorities and allocating resources on a day-to-day basis. Analyses were performed on task rankings between division and branch chiefs, AFPROs and SPOs, and various AFPROs. It was found that managers at different levels and that AFPROs and SPOs generally agree with the priorities of contract management tasks. There are some differences between AFPROs; however, these may result from differing product lines or differing stages of production.

Researcher: Captain Brian McDonald

Project: Management by Objectives/Results (MBO/R) Program Evaluation (76-2)

Background: It takes three to five years to fully and effectively implement an MBO/R program within an organization. In the instance of AFCMD, the process may be lengthened due to the periodic turnover of military managers, both in the Headquarters and the field. Currently, the Headquarters has been under the MBO/R program for 2-1/2 years. The program was installed at field locations a little over a year ago. The command has several more months before the program is fully implemented and operating smoothly.

Since the beginning of the program, various surveys of management attitudes in general, of attitudes on MBO, and of MBO program knowledge have been taken at six-month intervals. At this point in time, it is appropriate that an in-depth analysis of this data be made. An adequate data base is now available from which program progress may be determined and necessary corrective actions implemented.

Conclusions: This study employed four survey instruments to determine AFCMD's progress in implementing its MBO/R Program. These were the Job

Description Index, the MBO/R Knowledge Survey, the MBO/R Attitude Survey, and the MBO/R Program Evaluation Survey. Analysis was performed for Headquarters responses and overall field responses. Also, individual detachment trends were examined in the appendices.

The basic conclusion of the study was that there wasn't sufficient follow-through by management in implementing the program. The controlling process seemed to be deficient since people didn't perceive objectives as being relevant to their jobs nor did they see failure to accomplish an objective as a problem. Also, some weaknesses in the supervisor/subordinate relationship were also uncovered.

Researchers: Captain Wayne S. Brothers  
Captain James A. Herrmann

## II. ON-GOING RESEARCH:

Project: Review of the AFCMD Management Information System (76-6)

Background: A few years ago, General Nunn did a review of the information flowing into the Headquarters and was able to eliminate a number of outdated or duplicated information requests. Since then new data requests have grown, creating a bigger demand on the AFPROs. New projects such as the Modified QAIS, MIS, and MET study promise to require even greater amounts of data. On top of these, there are PMAG recommendations that a time accounting system should be instituted for all functions in AFPRO. These requests, combined with the present need for PI, CMSEP, and MBO/R information by the Command Section, and individual directorates need for data from each division in the field could be consuming resources that may be adversely affecting the mission of the AFPROs.

To prevent a deterioration of the AFPRO mission, the needless and duplicated requests for data must stop. However, a simple review to weed out the nonessentials is not enough. Each new project certainly needs information so that logical conclusions may be drawn. In addition, data for Command decisions must remain available.

Therefore, what is necessary is a concentrated effort to create a Management Information System for AFCMD. This system should have available all information the Command Section or directorates need. If an integrated system is developed, it would reduce duplication of effort by different functions in the Headquarters. To create such a system, a review of all information flowing into Headquarters would be necessary to study the need for having such information on file. Once the need has been established, it would become an integral part of the total system.

Researchers: Lt Gary D. Proctor  
Capt Wayne S. Brothers  
Capt James A. Herrmann  
Capt Michael A. Yanke

Project: Flextime in AFPROs (77-1)

Background: Flextime has existed since the late 1960s as a viable work scheduling process for a variety of industries. Flextime has produced some specific, positive effects in terms of employee satisfaction, employee productivity, and management communications and has helped to reduce traffic congestion in the communities concerned.

AFCMD's involvement with operational flextime began with the AFPRO Westinghouse contract negotiations. In October 1976, a tentative flextime plan was presented during the negotiations as part of the management proposal. Since then the plan has been finalized as AFCMD's plan for testing flextime. The plan baselines employee attitudes about their job and certain job characteristics with the Job Diagnostic Survey. Next, a flextime publicity program will begin. The conclusion of the Headquarters-assisted publicity program will be a briefing and the administration of a flextime survey. The results of the flextime survey will be given to the AFPROs flextime committee. The committee will determine the flextime program for the AFPRO subject to AFPR approval. A one-year test program is scheduled to begin 1 June 1977. The JDS and Flextime Surveys will be readministered twice during the one-year test to measure changes in employee attitudes.

Researcher: Captain Michael A. Yanke



PART IV

BIBLIOGRAPHY OF COMPLETED STUDIES

## BIBLIOGRAPHY OF COMPLETED STUDIES

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