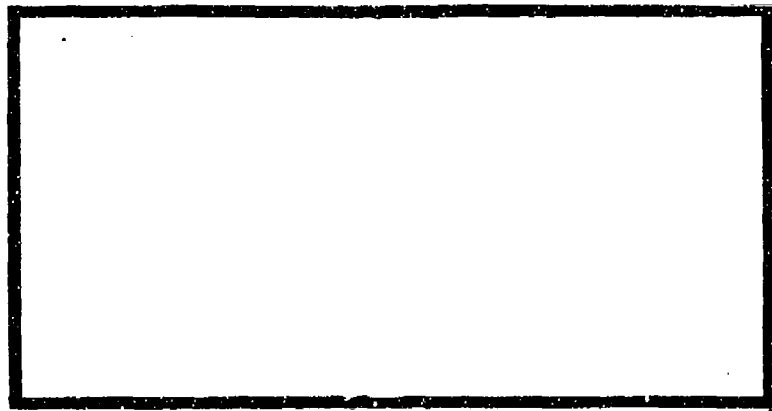


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A COMPARATIVE EVALUATION OF THE EFFECTS OF THE IMPLEMENTATION OF THE PRODUCTION ORIENTED MAINTENANCE ORGANIZATION (POMO) ON AIRCRAFT MAINTENANCE

Dwight J. Foster, Captain, USAF  
John C. Olson, Captain, USAF

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The Production Oriented Maintenance Organization (POMO) represents an Air Force initiative directed at increasing effectiveness and efficiency within the aircraft maintenance organization. Although many operational units have implemented POMO, its impact on maintenance performance and maintenance personnel has not been fully evaluated. This research was directed at determining what effect, if any, POMO has had on the aircraft maintenance organization and its assigned personnel. Eighteen research variables relating to maintenance performance and the behaviors/attitudes of maintenance personnel were identified and used in making this determination. Data for analysis were obtained from three wings within the Tactical Air Command - the 4th Tactical Fighter Wing at Seymour Johnson Air Force Base, North Carolina; the 31st Tactical Fighter Wing at Homestead Air Force Base, Florida; and the 388th Tactical Fighter Wing at Hill Air Force Base, Utah. Research results showed no improvements in maintenance performance and the behaviors/attitudes of maintenance personnel under the POMO concept while five variables showed a degradation. Within the scope of this research, the authors conclude that POMO has had no positive effect and some negative effects on the aircraft maintenance activity.

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OF THE IMPLEMENTATION OF THE PRODUCTION  
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(POMO) ON AIRCRAFT MAINTENANCE.

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Presented to the Faculty of the School of Systems and Logistics  
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In Partial Fulfillment of the Requirements for the  
Degree of Master of Science in Logistics Management

By

10 Dwight J. Foster  
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This thesis, written by

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MASTER OF SCIENCE IN LOGISTICS MANAGEMENT

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The Air Force Office of Scientific Research funded the Job Attitude Survey administered to aircraft maintenance personnel at Seymour Johnson AFB, Homestead AFB, and Hill AFB. This survey provided the instrument for obtaining the attitudinal data used in this research.

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## Chapter 1

### INTRODUCTION

Significant advancements in technology have resulted in production of aircraft weapons systems which are more sophisticated than ever before. This sophistication has required that the personnel responsible for the maintenance of these systems possess an increased level of knowledge and training. Other forces have also influenced aircraft maintenance philosophies and capabilities which are in conflict with the requirements of increased technician competence and abilities. Paramount among these factors are budgetary constraints and the requirements for reduced force levels. Major General William R. Nelson, the Air Force Director of Maintenance, Engineering, & Supply, has stated:

To say that base level maintenance today is a management challenge is an obvious understatement of the issue. Every base maintenance organization in the Air Force has many people who are working long, hard hours to meet our flying programs and achieve the increased readiness and sortie production/surge capability the Air Force is seeking. However, given the constraints in people and dollars we are faced with, there is a limit to how much 'running faster, jumping higher, and sweating more' we can do without some major changes in the way we go about our business [Nelson, 1977, p.2].

In order to meet this challenge, initiatives have been proposed toward realizing greater effectiveness and efficiency

of the limited Air Force resources currently available -- these resources being time, personnel, and dollars. The Production Oriented Maintenance Organization (POMO) represents one of these initiatives.

### What is POMO?

#### An Aircraft Maintenance Strategy

The objectives of POMO. From its inception, the basic objective of POMO has been to provide a more effective and efficient aircraft maintenance organization. This organization has been designed to provide a maintenance capability which would be responsive under both peacetime and wartime conditions. This new maintenance organization concentrates the efforts of each individual, and the group as a whole, towards achievement of the overall goals of the maintenance activity. Prime emphasis is redirected toward producing operationally ready aircraft and aircraft sorties instead of achieving differentiated, specialty-oriented goals of the specialist organization established by Air Force Manual 66-1, "Maintenance Management".

Under the POMO concept, the Deputy Commander for Maintenance (DCM) retains essentially the same mission responsibilities and support requirements which had been assigned under the specialized maintenance concept. The same types and levels of maintenance previously provided are to be continued under POMO. This new maintenance strategy,

however, introduces a new consideration which significantly impacts the organizational design of the maintenance activity. This new factor is the distinction made between on-equipment and off-equipment maintenance.

On-equipment/off-equipment maintenance. All maintenance tasks under POMO are divided into two broad categories: on-equipment and off-equipment. On-equipment maintenance includes those operations which are performed directly on the aircraft or installed equipment. Specific maintenance operations in this category include aircraft inspection, servicing, lubrication, and jacking; changing of aircraft tires; adjustment and replacement of aircraft assemblies, subassemblies, and parts; and weapon system servicing and munitions loading operations. Off-equipment maintenance consists of those actions in support of aircraft operations which would normally be performed within a shop environment. Specific operations categorized as being in-shop maintenance include the calibration, repair, and replacement of damaged or unserviceable assemblies, components, or parts; modification of material; and the manufacture of unavailable parts (AFR 66-5, 1977).

Maintenance personnel assignment. Under POMO, personnel and specialists available to the maintenance organization are assigned to one of the two broad categories

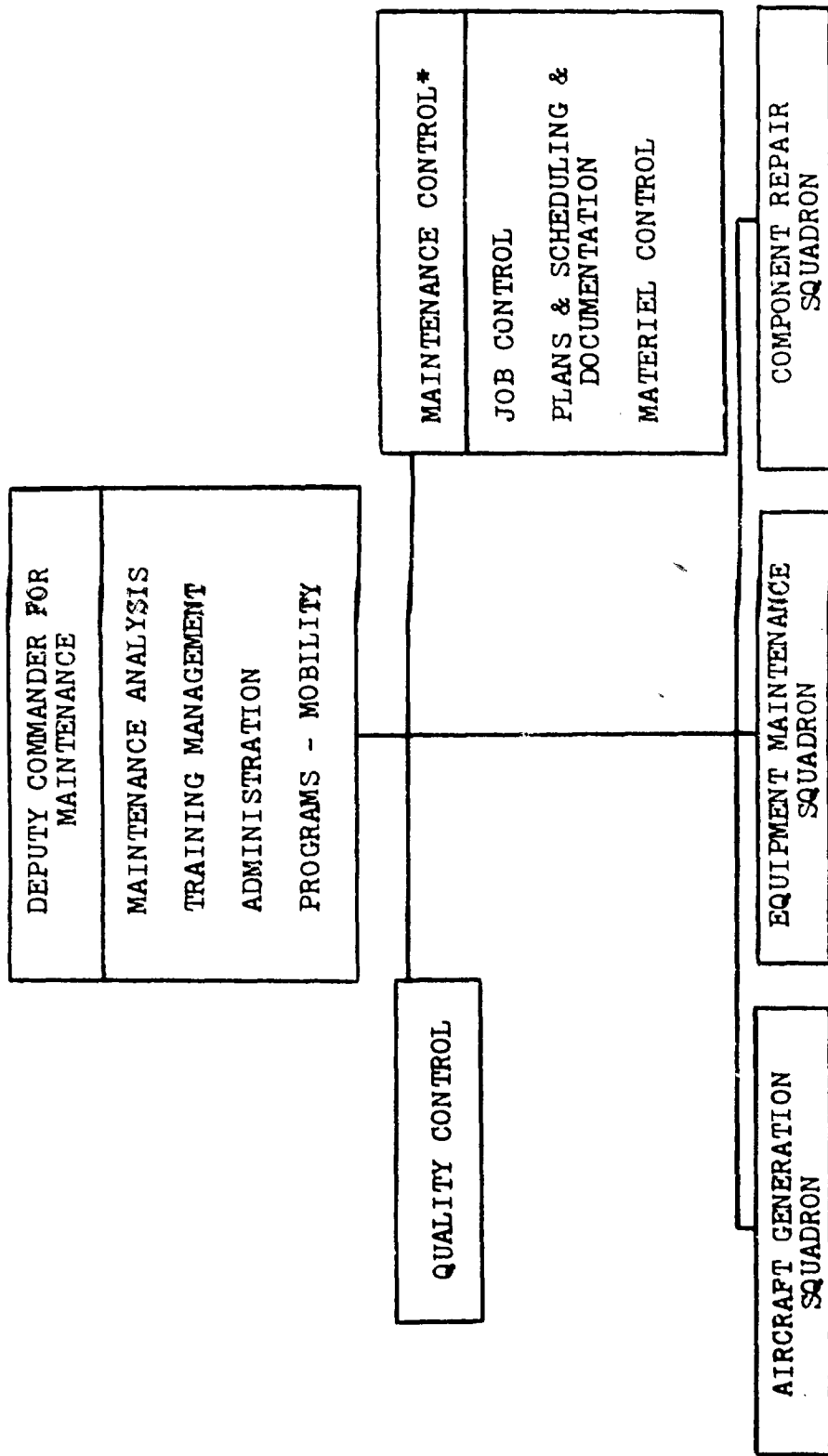
according to job requirements and workload. Whereas specialists had previously been assigned to a specialty shop and were dispatched when required to perform a maintenance operation, they may now be assigned directly to the flightline organization. In addition, a reallocation of maintenance facilities locate those personnel performing on-equipment maintenance in as close a proximity to the flightline as possible. This action was taken to minimize technician response time for required maintenance operations. The intermixing of different specialties within a particular organizational group opens the way for cross utilization of personnel with a potential for greater maintenance technician flexibility, improved manhour utilization, and reduced manpower requirements.

#### A Change of Structure within the Maintenance Organization

The significant changes in maintenance strategy proposed by POMO require a change in the basic structure of the aircraft maintenance organization. Although the maintenance squadron concept has been retained under POMO, the designations of these functional activities have been changed. Maintenance operations which had previously been performed by the Organizational, Avionics, Field and Munitions Maintenance Squadrons have been assumed by the Aircraft Generation,

Equipment Maintenance, and Component Repair Squadrons. Under the POMO concept, aircraft maintenance is organized as shown in Figures 1-4.

Aircraft Generation Squadron. The Aircraft Generation Squadron, or AGS, is responsible for maintenance operations which are performed on the aircraft. This on-equipment type of maintenance is usually performed on the flightline. The AGS is further subdivided into smaller operating units designated as Aircraft Maintenance Units (AMU's). The Aircraft Generation Squadron of a standard aircraft maintenance organization within TAC will usually consist of three AMU's. Each one of these smaller units corresponds to an individual aircraft squadron within a tactical fighter wing. An AMU will be assigned with maintenance responsibility for a specific number of designated aircraft. Dependent upon the type and quantity of aircraft to be maintained, this number usually varies from 18-30. Maintenance personnel assigned to a specific AMU are responsible for the support and maintenance of the aircraft within their particular unit. Although aircraft are segregated for maintenance purposes and assigned to specific AMU's, all airframes are scheduled and utilized as combined wing resources (AFR 66-5, 1977).



\* May include Munitions Control

Figure 1. Deputy Commander for Maintenance (Under POMC)

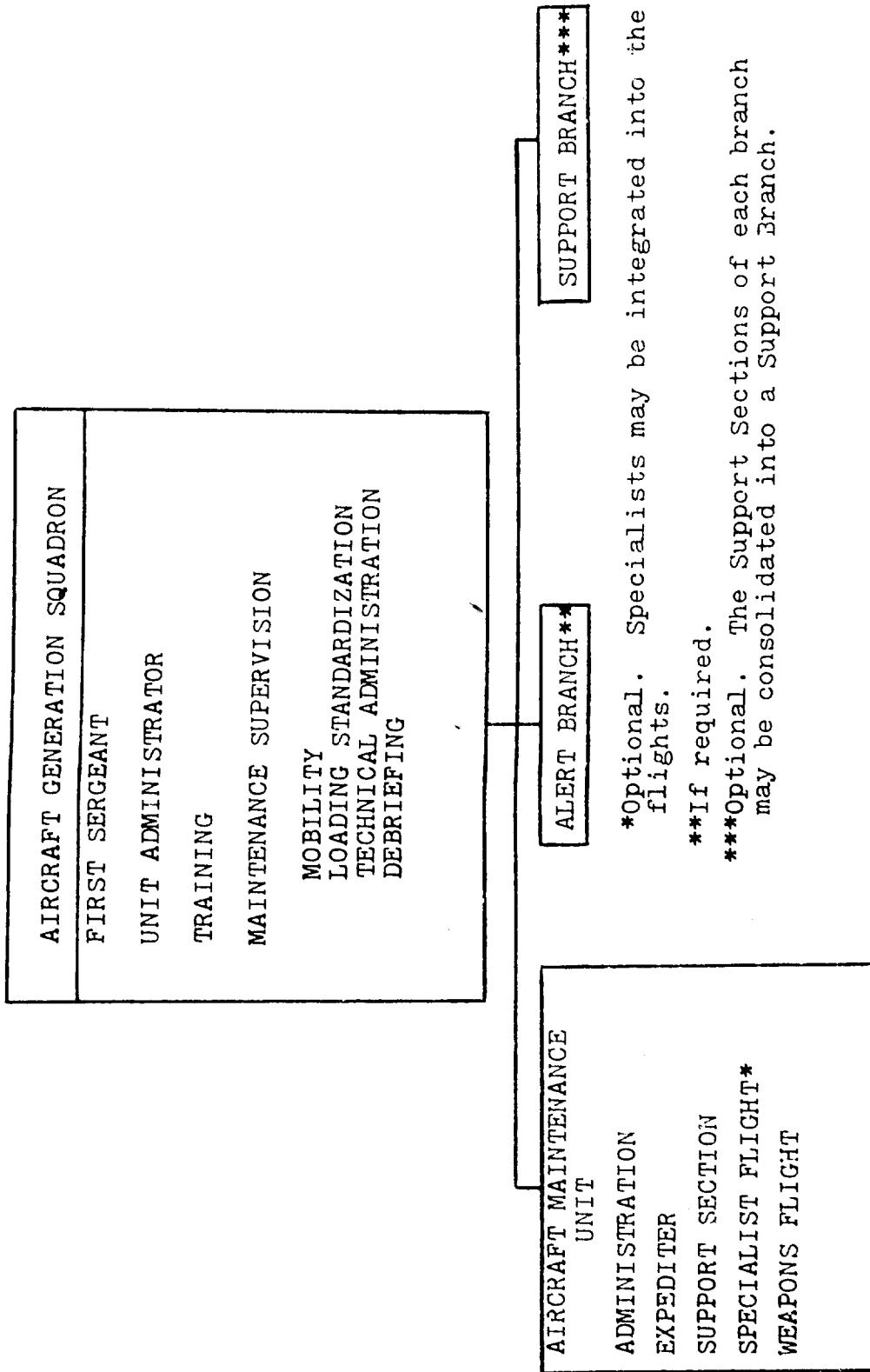
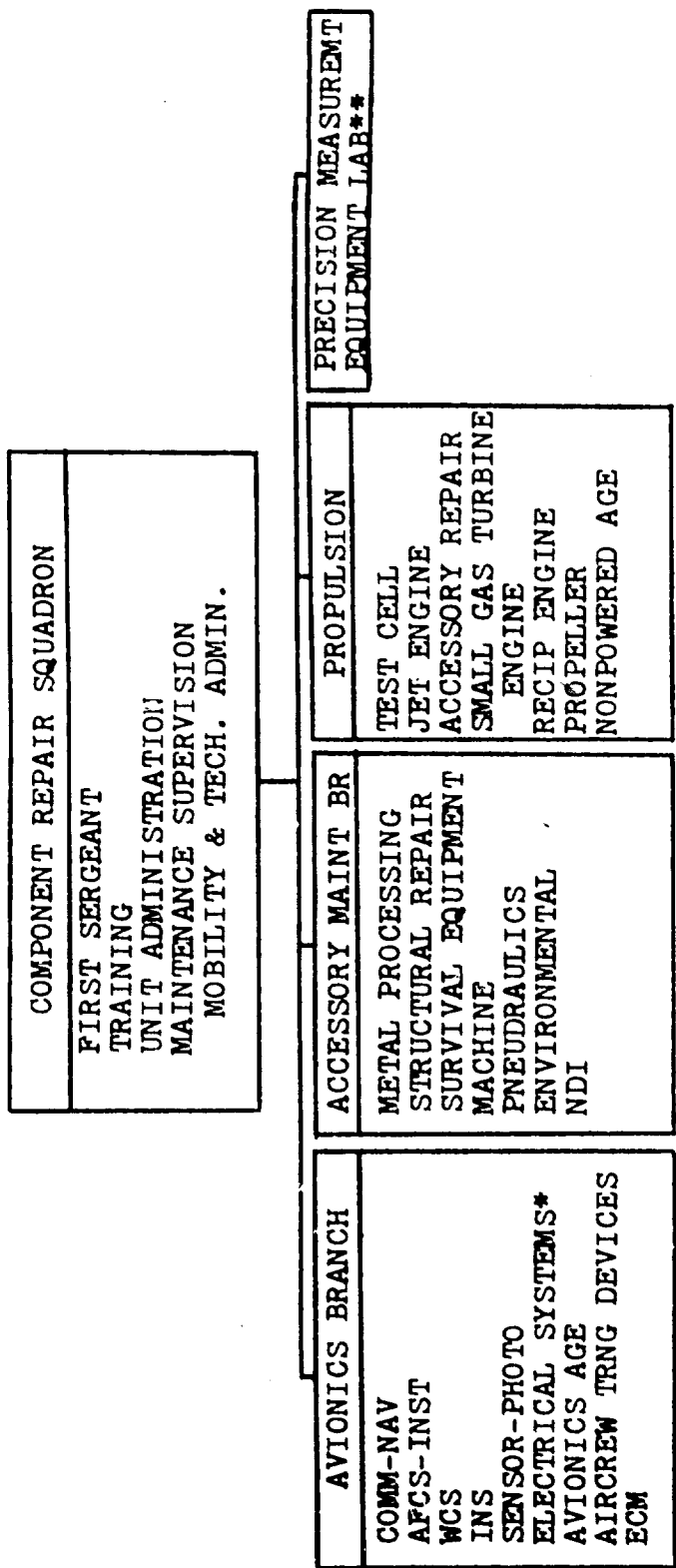


Figure 2. Aircraft Generation Squadron.

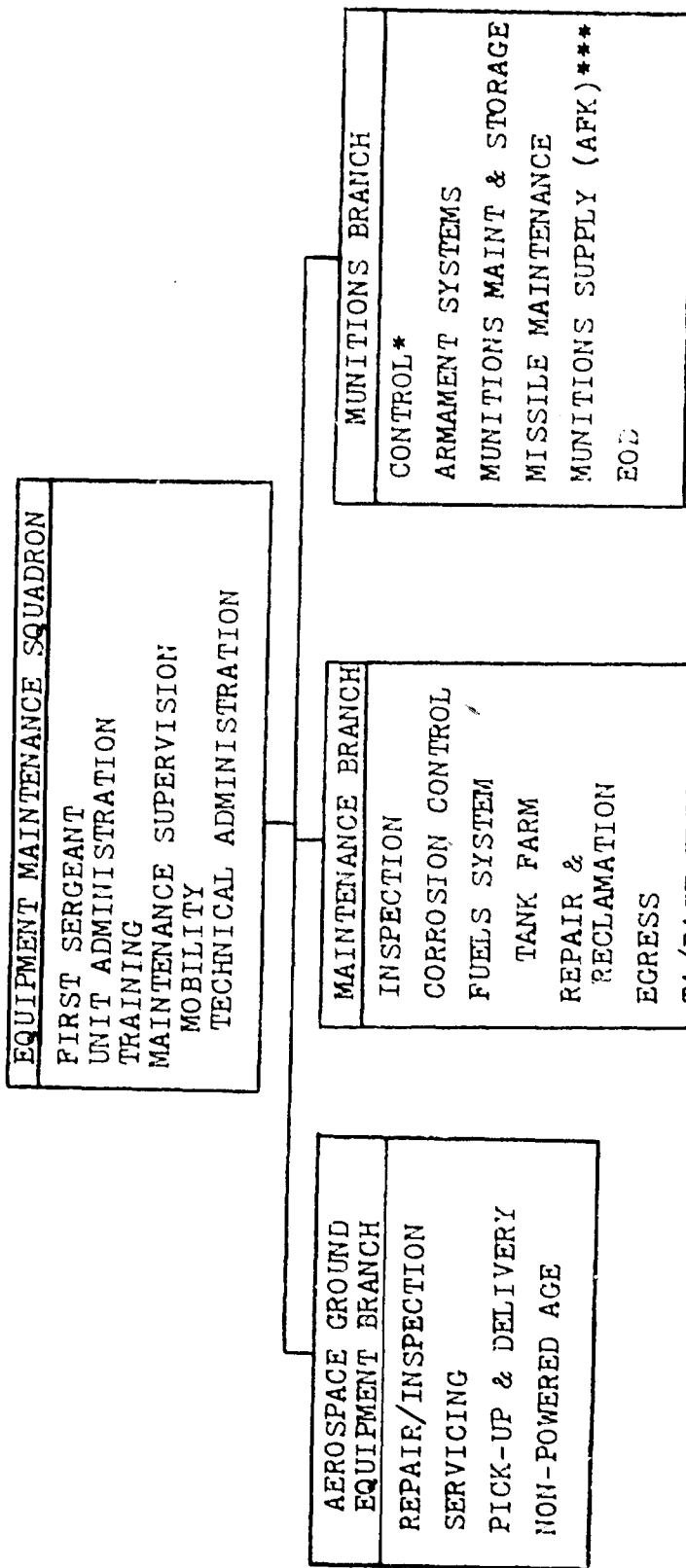


\* May be located in the Accessory Maintenance Branch (as determined by the MAJCOM/LGM)

\*\* May be consolidated with the Avionics Branch

Figure 3. Component Repair Squadron





9

\* May be consolidated with Maintenance Control

\*\* May be placed under Squadron Commander at MAJCOM option

Figure 4. Equipment Maintenance Squadron

Component Repair Squadron. The Component Repair Squadron, or CRS, performs a significant portion of the off-equipment maintenance directly relating to the aircraft being supported. The CRS incorporates many of the functions which had previously been assigned to the Avionics and Field Maintenance Squadrons under the specialized maintenance concept. Maintenance operations performed by the CRS include those which do not conflict with the tasks assigned to the Aircraft Generation Squadron. The role of the CRS is basically supportive in nature to the AGS involving primarily the repair and manufacture of aircraft components. Specific responsibilities include off-equipment repair of aircraft and support equipment components; maintenance beyond the scope or capability of the other maintenance squadrons; repair and calibration of precision measuring equipment; off-equipment repair of avionics components; and maintenance of the aircraft propulsion system (AFR 66-5, 1977).

Equipment Maintenance Squadron. The Equipment Maintenance Squadron, or EMS, is responsible for the performance of the remainder of off-equipment maintenance which is not assigned to the CRS. The EMS has assumed a number of the functions previously performed by the Field Maintenance Squadron and, with the exception of weapons loading and on-aircraft weapon system servicing, all those previously assigned to the Munitions Maintenance Squadron. As with the

CRS, the Equipment Maintenance Squadron performs a supportive function to the AGS. Its primary concern, however, is not only directed to aircraft support but also extends to the maintenance of weapons system support and handling equipment. Specific responsibilities of the EMS include special aircraft inspections, fuel and egress system maintenance, corrosion control, repair and reclamation, maintenance of aerospace ground equipment (AGE), weapon systems support, and base flight operations (AFR 66-5, 1977).

#### A Change of Maintenance Approach

As a result of POMO, a number of significant changes were required from the traditional specialized maintenance concept.

Realignment of maintenance tasks and responsibilities. The most obvious change which resulted from POMO was an almost complete reorganization of the maintenance activity with the reassignment of many maintenance tasks. As a result of this reorganization, the number of maintenance squadrons was reduced from four to three. Previously, maintenance personnel had been segregated by their specialties and assigned to their appropriate maintenance squadron. POMO retains, to a limited extent, this segregation of maintenance technicians by specialties within the CRS and EMS. A significant change, however, in personnel assignment

philosophies has been effected within the AGS. This change has been required by the formation of Aircraft Maintenance Units (AMU).

The primary concern of the AMU has been directed to total system support and reliability. Under the traditional maintenance concept, aircraft repair was accomplished through conduct of a series of individual tasks with little or no integrated effort on the part of specialists involved. Under POMO, maintenance personnel of different specialties are consolidated into semi-autonomous functional units. It is intended that each Aircraft Maintenance Unit possess the capability to accomplish all on-equipment maintenance on those aircraft for which it is assigned maintenance responsibility. The association of maintenance personnel with specific aircraft and air crews is supposed to enhance mission identification and esprit de corps. The structure of the AMU also allows maintenance personnel to become more familiar with particular maintenance requirements of specific aircraft and more personally involved in their total support. Emphasis is redirected toward integrating the efforts of all unit personnel towards achievement of the maintenance organization's production-oriented goals.

Decentralization of control. The decentralization of control which resulted with POMO represents another significant change from previous maintenance philosophies. In

the past, all flightline maintenance was to be initiated and controlled from a central focal point, specifically Job Control. Decentralization of control under POMO allowed maintenance squadrons and work centers within the squadrons to perform scheduled and unscheduled maintenance within their capabilities without specific direction from Job Control. Maintenance managers and supervisors were to be allowed to exert more influence over the conduct of operations performed in their areas of responsibilities.

Management and control of the maintenance effort within the Aircraft Generation Squadron has been delegated from Job Control to an expediter assigned to the Aircraft Maintenance Unit. This expediter is located on the flightline and provides a visible focal point for all maintenance operations performed within the AMU. The expediter's mobility and current knowledge of all on-going maintenance operations are intended to provide a highly efficient and responsive environment for the conduct of routine maintenance and servicing operations. The urgency of a maintenance action can be assessed on the spot and technician support requested from a work force which is assigned and available within the AMU.

The authority to manage and control maintenance personnel within the CRS and EMS has also been increased under POMO. This decentralization of control from Job Control

provides supervisory personnel within these maintenance squadrons with greater flexibility in the utilization of their assigned work forces.

Implementation of POMO has not eliminated the requirement for Job Control. Although the maintenance squadrons are afforded greater internal control authority, Job Control continues to function as a coordinating activity with responsibility for insuring continuity of all maintenance operations toward meeting overall maintenance organizational goals.

Personnel training under POMO. One of the intended benefits of POMO was the increased utilization of maintenance personnel. The previous specialized maintenance concept had restricted the cross-utilization of maintenance technicians. The unique training requirements and specific job description of these personnel clearly defined their duty responsibilities. The consolidation of specialists within the Aircraft Maintenance Units provided an opportunity to more effectively utilize this available manpower. Under POMO, a cross-utilization training (CUT) program has been implemented which allows maintenance personnel to perform certain maintenance tasks which they were previously unauthorized to accomplish. For example, all personnel assigned to the AMU's are to be task qualified on aircraft launch and recovery, aircraft towing, aircraft wash, and aircraft

refueling. In addition, selected personnel can be trained on other tasks such as aircraft jacking, aircraft defueling, and installation and removal of external stores (AFR 66-5, 1977).

#### Problem Statement

The basic premise for implementation of the Production Oriented Maintenance Organization (POMO) is to provide an aircraft maintenance philosophy and methodology which would allow more effective and efficient utilization of Air Force personnel and resources (Nelson, 1977, p.3). Although all tactical fighter wings within the Tactical Air Command have been directed to reorganize their aircraft maintenance functions under the POMO concept, the effects of this change, both on the maintenance performance of the unit and the work behaviors/attitudes of assigned maintenance personnel, have not been fully evaluated. The specific purpose of this research is to assess the impact of POMO implementation on maintenance performance and individual work behaviors/attitudes.

#### Justification

There are currently over 135,000 Air Force personnel engaged in maintenance operations involving approximately 3400 aircraft (Beu & Nichols, 1977, pp.63-65). The magnitude of these numbers alone attests to the fact that aircraft maintenance represents one of the major operational

activities in the Air Force. Each individual currently assigned to aircraft maintenance duties has been trained and has operated under a concept which has emphasized a specialty-oriented maintenance philosophy. The decision to implement POMO represented a marked change in these previously established maintenance philosophies and one which was expected to produce significant effects throughout the maintenance organization. Factors which were anticipated to be affected by adopting the POMO concept included aircraft maintenance performance and the work attitudes/behaviors of maintenance personnel. A research effort is required to investigate the impact of this new concept on the aircraft maintenance organization and its personnel.

#### Research Objectives

The limited information currently available on the consequences of reorganizing the aircraft maintenance activity under the POMO concept provides the impetus for this research effort. Three primary research objectives will be addressed during this study in order to provide an increased knowledge and understanding of the impact of POMO on the aircraft maintenance organization.

The initial objective of this research is to evaluate the effects of POMO on selected measures of maintenance performance within the aircraft maintenance activity.



The second objective of this research is to evaluate the effects of POMO on selected measures of the behaviors of aircraft maintenance personnel.

The third objective is to evaluate, using selected indicators, how POMO has influenced the attitudes of aircraft maintenance personnel.

### Research Hypotheses

The basic purpose for implementation of the POMO concept was to realize increased effectiveness and efficiency within the aircraft maintenance activity. Based upon this premise, this research will seek to determine if POMO has had a positive effect on both maintenance performance as well as the personnel required to accomplish aircraft maintenance operations.

Eighteen hypotheses will be evaluated during this research effort. Due to the closely related nature of many of the indicators used as the basis for these hypotheses, they have been grouped into three major categories. These categories are directly related to the stated research objectives. That is, the first group of hypotheses deal with maintenance performance; the second group with personnel behavior, and the third group with personnel attitudes. Each hypothesis will be evaluated relative to equivalent measures under the specialized maintenance concept (AFM 66-1). The categories and specific hypotheses to be evaluated with each are:

1. *Those related to maintenance performance:*

- a. Hypothesis 1: The percentage of operational aircraft will increase under the POMO maintenance concept.
- b. Hypothesis 2: The percentage of aircraft which are not flyable due to maintenance will decrease under the POMO concept.
- c. Hypothesis 3: The percentage of aircraft which are not flyable due to the non-availability of repair parts will decrease under the POMO concept.
- d. Hypothesis 4: The percentage of aircraft which are flown as scheduled will increase under the POMO concept.
- e. Hypothesis 5: The percentage of aircraft aborts will decrease under the POMO maintenance concept.
- f. Hypothesis 6: The number of aircraft maintenance actions which require cannibalization of repair parts from another aircraft will decrease under the POMO maintenance concept.
- g. Hypothesis 7: The percentage of satisfactory equipment evaluations performed by Quality Control will increase under the POMO concept.
- h. Hypothesis 8: The percentage of available maintenance technician manhours consumed in direct labor will decrease under the POMO maintenance concept.

2. Those relating to the behavior of maintenance personnel:

a. Hypothesis 9: The percentage of first-term maintenance personnel who reenlist will increase under the POMO maintenance concept.

b. Hypothesis 10: The percentage of second-term maintenance personnel who reenlist will increase under the POMO maintenance concept.

c. Hypothesis 11: The percentage of career maintenance personnel who reenlist will increase under the POMO maintenance concept.

d. Hypothesis 12: The percentage of career maintenance personnel who retire will decrease under the POMO maintenance concept.

e. Hypothesis 13: The percentage of maintenance personnel who receive administrative discharges will decrease under the POMO maintenance concept.

f. Hypothesis 14: The percentage of satisfactory personnel evaluations performed by Quality Control will increase under the POMO maintenance concept.

3. Those relating to the attitudes of maintenance personnel:

a. Hypothesis 15: The group climate among aircraft maintenance personnel will be perceived as being improved under the POMO maintenance concept.

b. Hypothesis 16: Perceived work group productivity will be higher under the POMO maintenance concept.

c. Hypothesis 17: Perceived work group relations among aircraft maintenance personnel will be improved under the POMO maintenance concept.

d. Hypothesis 18: Maintenance personnel will experience higher levels of job satisfaction under the POMO maintenance concept.

## Chapter 2

### LITERATURE REVIEW

Although the acronym POMO is relatively new and many maintenance personnel currently within the Air Force may be unfamiliar with its philosophies and strategies, the basic ideas which this concept proposes are not new at all. In fact, there appears to have been not an evolution of a new aircraft maintenance system, but rather a reversion to a system similar to one which was abandoned by the Air Force almost 25 years ago. This chapter presents the early philosophies of aircraft maintenance beginning with World War II and traces the evolution of these philosophies. An historical overview of POMO is presented from its inception through its initial implementation within the Tactical Air Command.

Implementation of POMO was directed within TAC to realize economies of resources and to affect certain operational changes within the maintenance organization. This chapter will identify previous research efforts which have been conducted to evaluate these factors and the impact which they have had on organizational performance and personnel work attitudes and behavior.

## A Historical Overview of Aircraft Maintenance

### World War II Aircraft Maintenance

At the onset of World War II, aircraft maintenance was functionally divided into four echelons or organizational levels. Personnel performing duties at the first and second levels were assigned and located at the operating base. These personnel were responsible for the servicing of aircraft and other limited maintenance actions. Their efforts were limited mainly to the removal of minor aircraft components and, to a small extent, the repair of this hardware. The third organization level was tasked with the primary responsibility for aircraft maintenance actions involving the replacement and repair of major aircraft components. While this maintenance echelon was also located at the operating base, it was organized as a functional component of the Air Service Command, later designated as the Air Force Logistics Command. The fourth level of maintenance was organized to perform depot level operations involving major system overhaul, phase inspections, and major aircraft modification. This depot maintenance activity was comparable to the present-day Air Logistics Center (Egerton, Muterspaw, & Wood, 1963).

Maintenance at the operating base was accomplished by teams of technicians organized under a crew concept. Each crew was headed by a fully qualified Non Commissioned

Officer and all personnel were highly trained and possessed the skills necessary to deal with all aspects of required flightline maintenance operations (Craven and Cate, 1955, p.80). At the onset of World War II, aircraft systems being maintained were relatively simple in design, compared to current aircraft systems, and were few in types. The 38-week general aircraft maintenance course provided sufficient time to adequately train aircraft mechanics and support personnel. With only two exceptions, this comprehensive training had been directed toward providing the skills necessary to support all the various components of all aircraft types. Armament and electronics functions were separately organized to deal with maintenance of those peculiar subsystems (Egerton, et al., 1963, pp.7-9).

Direct United States participation into World War II prompted dramatic changes in both existing aircraft maintenance philosophies and procedures. These changes were precipitated by the fact that aircraft were becoming more complicated. Operational necessity drove invention and, as a result, a relatively small number of aircraft types mushroomed into a myriad of technically-advanced aircraft which ranged from single-engine fighters to multi-engined bombers. This situation was further complicated by the ever-increasing numbers of aircraft to be maintained. Between 1940 and 1943, over 159,000 aircraft were produced in the United States and Canada (Egerton, et al., 1963, p.8). The

expansion of technology coupled with an increase in aircraft, both by number and type, placed a tremendous strain on the maintenance capability. There were simply not enough aircraft mechanics to meet the demands which existed both at base and depot level.

The Air Service was driven to make a decision to alleviate this situation and the decision was specialization. Mechanics were to be trained in a shorter time on a narrower area of expertise. Mass production techniques were employed to maximize personnel output (Craven and Cate, 1955, p.612). At the base level, however, the team concept continued. Whereas the training methodology for aircraft maintenance personnel had changed, the existing operational situation did not benefit from this new concept. Problems were soon encountered in maintaining aircraft with, what appeared to be, poorly trained and inexperienced mechanics. This led to unfortunate results. The not-operationally-ready (NOR) rates for aircraft and mid-air failure rates were extremely high. In late 1944 on early raids over Japan, mechanical defects kept 51 percent of launched aircraft from reaching their primary targets (Gurney, 1961, p.164).

During March 1945, "the 499th Bomb Group--without authority--abandoned the crew chief maintenance system and developed a functional organization [Egerton, et al., 1963, p.14]." This concept resulted in a significant improvement in maintenance capability through better use of limited



resources and resulted in a marked improvement in readiness and available flying hour rates. Other units within the Pacific Theatre soon adopted this new maintenance philosophy. In effect, technician specialization had replaced technician generalization as the preferred maintenance concept (Egerton, et al., 1963, p.11).

#### Post-World War II Changes

After World War II, however, this specialist-oriented maintenance concept was not adopted for standardization within all units of the Army Air Forces. It was not until 1950 that the Strategic Air Command formally implemented a functional maintenance concept. This functional concept was based upon a high level of specialized training for maintenance personnel and their assignment to specific activities responsible for the maintenance of peculiar aircraft subsystems (i.e. avionics, weapons, etc.). Similar actions were taken by the Air Defense Command in 1957 and the United States Air Forces in Europe in early 1958. On 1 July 1958, Air Force Manual 66-1, "Maintenance Management", provided mandatory guidelines for all aircraft maintenance organizations within the Air Force. This directive established a standardized aircraft maintenance organization consisting of functional components, or squadrons, with each to be responsible for the maintenance of specific aircraft subsystems (Egerton, et al., 1963, p.16). These squadrons were

manned by maintenance personnel who had received a high level of specialized training on these subsystems. Specialized aircraft maintenance was to continue basically unchanged until 1974.

#### The Conception of POMO

With the conclusion of United States operations in South East Asia, factors such as inflation, increasing weapon system costs and reduced manpower and budget levels required a continual search for economies in the use of all Air Force resources. The requirement to "do more with less" prompted many programs to improve the effectiveness and efficiency of these resources. In September 1974, General David C. Jones, the Air Force Chief of Staff, directed the implementation of one such program--the Maintenance Posture Improvement Program. The main objectives of this program were to improve aircraft maintenance effectiveness and to reduce all costs associated with these maintenance operations. A critical review of all previous and on going maintenance philosophies and methodologies was to be conducted with an eye toward improving all aspects of aircraft maintenance (Halsell, 1977, p.9).

In response to this basic direction, a review of existing maintenance policies and procedures was initiated within the Tactical Air Command. One of the ideas which emerged from this effort was the Production Oriented

Maintenance Organization, commonly referred to as POMO (Beu & Nichols, 1977, pp.78-79). The basic POMO concept was viewed as offering a feasible approach toward realizing greater maintenance efficiency and utility of maintenance personnel.

#### Implementation of POMO

During January 1975, TAC requested Air Staff authority to evaluate the POMO concept in an operational environment. Approval for this test effort was granted during February 1975. The 56th Tactical Fighter Wing at MacDill Air Force Base, Florida, was selected as the initial test unit for this program (Halsell, 1977, p.52). The test was conducted in three phases during the period 10 March through 13 November, 1975. Upon completion of this test, the aircraft maintenance activity was fully organized under POMO. Subsequent action was taken by TAC to establish a schedule for the extension of POMO to other organizational units within the Command. With the exception of four units, all wings within TAC will be organized and will be operating under POMO by the end of December 1978. In addition, selected operational units within PACAF and USAFE have been identified for transition to the POMO concept of aircraft maintenance.

Previous Research: The  
Impact of Change

Applicability of Previous  
Research to POMO

Implementation of POMO required that significant changes be made in the structure, operation, management, and control of the existing aircraft maintenance organization. Figure 5 presents the differences between the POMO and the specialized maintenance concepts. The most significant effects of these changes included:

1. A shift from the efforts of the individual to those of the group.
2. An emphasis on total system support rather than support of individual aircraft subsystems.
3. An increased level of supervisor and worker autonomy.
4. Greater delegation of authority for decision making to flightline and shop personnel.
5. An effort to enhance worker identification with the mission of the maintenance organization.
6. A realignment of duty responsibilities and training requirements to realize greater utility and flexibility of maintenance personnel.

In the study of organizational theory, a large amount of research has evaluated the impact of various change mechanisms on organizational performance and employee attitudes and behavior. These studies have considered

Characteristic	POMO Maintenance Concept (AFM 66-5)	Specialized Maintenance Concept (AFM 66-1)
Number of squadrons	3 (Aircraft Generation, Component Repair, Equipment Maintenance)	4 (Avionics, Field, Organizational, Munitions)
Span of control	More decentralized (In shop & AMU expediter)	Highly centralized in Job Control
Orientation of maintenance operations	Production oriented to total system support	Oriented to specific maintenance tasks
Maintenance manning philosophy	Specialist integration into work groups	Specialist segregation into squadrons
On-equipment maintenance	Responsibility of Aircraft Generation Squadron	Responsibility of all maintenance squadrons
Off-equipment maintenance	Responsibility of Component Repair and Equipment Maintenance Squadrons	Responsibility of Avionics, Field, and Munitions Maintenance Squadrons
Maintenance personnel utilization	In specialty plus added maintenance tasks	In specialty only
Maintenance personnel training	In specialty plus cross utilization training	In specialty only

Figure 5. Comparison of POMO and Specialized Maintenance Concepts

factors such as group performance, task specialization and variety, autonomy, span of control and supervision, task identity and significance, job scope, and others. Many of these factors can be correlated to the effects which POMO has had on the aircraft maintenance organization. The results of this previous research will be used as a basis to support the hypotheses proposed in this study.

#### Research Results of Specific Change Factors

##### Decentralization of control.

Decentralization has been strongly supported by behavioralists because of the motivational effects it has on lower-level supervisors . . . . The opportunity to make decisions and be involved in management activates strong drives within the individual that result in greater commitment to the organization and greater individual productivity [Carlisle, 1974, p.14].

It is recognized that a sufficient level of control must be exercised within an organization if it is to achieve its stated goals. A controversy exists, however, as to the exact amount of control which is actually needed to insure effective management. Increasing evidence tends to support the contention that greater decentralization of worker control and the decision making process can have a significant effect on organizational performance and worker attitudes and behavior. Why the drive for decentralization? It is based on the contention that individuals possessing a first hand knowledge of the management situation will be in the

best position to evaluate it and to take or direct the required action. Referral of such situations through hierarchical channels can result in costly delays and inappropriate decisions.

Extensive research has been conducted to evaluate the issues of control, decentralization, span of control, and lower level decision making authority. In their study, Cummings, Malloy, and Glen (1975) identified the reduction in the number of levels in the control hierarchy as a means of effecting greater productivity, job satisfaction, or both. These findings are supported by studies conducted by Srivastva and Salipante (1976), Levine (1973), Ross and Murdick (1975), and Ivancevich and Donnelly (1975). The common theme of these research efforts is to reduce the complexity of organizational control and to extend decision making authority to the lowest possible levels.

Another factor, closely related to decentralization of control, which will impact on the organization is participative management. Chancey and Teel (1972) identified participative management as a means to reap high rewards within the organization--these rewards being increased production and improved employee attitudes. Greater direct involvement of the worker in organizational decision making would reduce the levels of frustration which they experienced in a highly regulated and controlled work environment. Haynes (1974) proposed delegation as the means of realizing these benefits.

In theory, participative management will promote greater worker involvement and, consequently, greater productivity. Since personnel feel they have more control over their work environment, job satisfaction is likewise enhanced. The results of research by Reimann (1975), Katzell and Yankelovich (1975) and Driscoll (1978) tend to support this theory. These research efforts emphasized the importance which the worker places on being able to influence his job. This feeling of participation will usually result in improved worker satisfaction.

#### Autonomy.

Recent experiments have demonstrated clearly that productivity of work groups can be greatly increased by methods of work organization and supervision which give responsibility to work groups and which allow for fuller participation in important decisions . . . . [Cartright, 1971, p.763].

Autonomy of the individual and the work group is closely associated with the question of decentralization of control. The relevance of such autonomy on organizational performance and the attitudes/behavior of its participants is becoming increasingly apparent. Bucklow (1977) has proposed that a critical factor in the design of any production system is autonomy. Davis (1975) has reported that research results support the assertion that when autonomy exists in a working environment, it will result in a higher level of work satisfaction as well as improved worker performance. One key to higher productivity, measured both in product



quantity and quality, seems to involve the participation of all organizational participants in the decision making process. Carlisle (1974, p.14) has concluded that "the opportunity to make decisions and to be involved in management activates strong desires within individuals that result in . . . greater productivity."

Srivastva and Salipante (1976) have identified autonomy as a prime ingredient toward realizing high levels of worker satisfaction and improved product quality. The research conducted by Lawler and Hackman (1971) supports the contention that autonomy strongly influences worker satisfaction and productivity. One conclusion drawn from the research completed by Cummings, Malloy, and Glen (1975) was that measures which were successful in increasing worker autonomy would also improve worker attitudes and job satisfaction. These research findings are supported by studies conducted by Reimann (1975), Katzell and Yankelovich (1975), and Cummings and Griggs (1976).

#### Group versus individual effort.

We now recognize that a highly cohesive group can motivate its members to work toward whatever the group has defined as its goals. If the group has accepted higher productivity as its goal, then its members will be higher producers \_\_\_ Robert L. Kahn [House, 1971, p.142].

In a study conducted to evaluate the quality and quantity of work performed by one worker or several operating together, Manners (1975) determined that the performance

of the group was significantly better than that of any one of the group members operating independently. Whereas the efforts of the individual working alone can be directed toward meeting required production goals, research has demonstrated the advantages of group coordination and group effort. The significance of the group structure itself has also been recognized in the evolution of organizational behavior. Emery (1977, p.253) has proposed that organizations will be required to alter their basic design. Where they were previously structured on a "one-man, one-job" basis under direct supervision, they would be required to adopt a semi-autonomous group arrangement.

Significant research has been conducted to evaluate the performance of such autonomous work groups. Cummings and Griggs (1976), Acquilano (1977), and Stone (1971) have completed studies in this area to determine the influence of the work group on organizational effectiveness and employee job satisfaction. The results of this research tends to support the hypothesis that greater organizational productivity and worker satisfaction will result when workers are organized into work teams. These improvements in worker performance and attitudes were attributed, in part, to increased feelings of group identity, cohesiveness, loyalty, purpose, and autonomy.

### Task/mission identification.

. . . the job must be perceived by the individual as requiring him to use abilities that he values in order for him to perform the job effectively. Only if an individual feels that his significant abilities are being tested by a job, can feelings of accomplishment and growth be expected to result from good performance [Lawler, 1972, p.163].

The close association which an individual feels to the "products of his labors" has emerged as an item of special interest in research involving the attitudes and behavior of workers. In their studies, Hackman and Lawler (1971) have correlated the core dimensions of a job, which include task identity, task variety, autonomy, and feedback, with such factors as worker motivation, satisfaction, and performance. Results of these studies indicate that the higher that jobs are in these dimensions, the greater will be the quality of the work performed and the level of worker satisfaction. One of these dimensions, task identity, could be viewed as how the worker relates to the products of the organization. These products could be either material or service oriented. The more able the worker is to identify with this product, the more responsible he will feel for its quality and performance (Argyris, 1977).

Of prime importance in being able to identify with organizational output is the question of adequate feedback. Feedback represents information received by workers concerning their performance and its impact on the product of the organization. In a study conducted by Cummings, Malloy, and

Glen (1975), the level of feedback received by the worker and its accuracy had a positive effect on organizational productivity. Similar research by Latham and Klein (1974), Kim and Hamner (1976), and Cummings, Schwab and Rosen (1971) substantiated the importance of providing feedback to all personnel within the organization.

#### Whole job versus task specialization.

Regardless of their theoretical position, most behavioral scientists regard extreme diversification of labor and the resulting specialization, as leading almost inevitably to monotony, job dissatisfaction and decreased performance [Hamner, 1974, p.289].

The importance of task specialization was previously acknowledged as a key to increased work productivity. As a result, ever increasing job specialization has continued to evolve in order to realize greater effectiveness and efficiency of personnel resources. Such economies, however, have resulted in adverse consequences which have degraded both the quality and, in many cases, the quantity of work produced by the employee. The drive towards specialization has tended to dehumanize the worker's job. Monotony and an inability to find meaningfulness in the job have produced a negative effect on the job satisfaction of many workers. Research studies which have evaluated the influences of increasing job variety to improve worker satisfaction have been conducted by Shepard (1970), Sexton and Yu-Chi-Chang (1976), Rousseau (1977), and Stone (1976). The results of

these research efforts support the contention that greater job variety and less task specialization will result in more satisfied workers.

Closely related to the idea of reduced task specialization is the issue of the "whole job". In making a product in its entirety, the worker will most likely be required to possess a variety of skills. Lawler and Hackman (1971) emphasized the meaningfulness of allowing a worker to use this skill variety in order to perform a complete job. Subsequent research by Cummings, Malloy, and Glen (1975), Fryer and Zimmerer (1975), and Cummings and Griggs (1976) confirmed the relevance and importance of the "whole job" in the work environment. Based upon the results of this research, one way of realizing greater worker productivity and job satisfaction appears to be allowing a worker, or an autonomous work group, to complete a product from start to finish.

#### Job enrichment.

Job enrichment has become recognized in a relatively short time as one of the best solutions to problems associated with the job itself and as an effective means of increasing worker satisfaction and productivity [Moncyka and Rief, 1975, p.151].

Efforts to change the character of the workers job and his work environment thru job enrichment have had a significant impact on the attitudes and behavior of workers within the organization. Based upon the results of numerous

studies in this area, Argyris (1977) has reported that jobs which allow greater degrees of self-regulation, self-evaluation, and participation tend to produce improved worker attitudes and increased worker productivity. As defined by Korman (1977, p.297), job enrichment can be pursued along two axes. Horizontal job enrichment provides the worker with a greater variety of tasks to accomplish with improved feedback on his performance. Vertical job enrichment provides the worker with greater opportunity to participate in decision making for issues relating to his job.

Numerous experiments have been conducted to evaluate the influence which job enrichment has on organizational performance and worker attitudes. These studies included those conducted by Janson (1971), Dettleback (1971), and Mayer and Overbaugh (1971). An improvement in performance and attitudes were reported through the implementation of various job enrichment programs. Other studies performed were able to correlate job enrichment to either one or the other of these factors, but not to both. Research results by Umstot, Bell, and Mitchell (1976) and Horstman and Kotzun (1977) established a strong positive relationship between job enrichment and worker satisfaction. Similar studies by Ford (1973), Herzberg and Rafalko (1975), McNulty (1973), and Randall (1973) realized results which tended to support a positive job enrichment - worker performance correlation.

## Summary

This research effort was concerned with POMO and the impact which this new maintenance concept has had on the aircraft maintenance organization. The purpose of this chapter has been two-fold. First, an historical overview of aircraft maintenance provided a background for understanding how the specialized maintenance concept had evolved since World War II and why there was a need for change. This overview provided insight into the motivating influences for the conception and adoption of POMO. Second, POMO philosophies and practices required an understanding of various change factors that could be expected to impact maintenance performance and maintenance personnel behaviors/attitudes. A significant amount of research has been accomplished to evaluate the effects of group effort, increased autonomy, greater decentralization of control, improved task/mission identification, job enrichment, and the "whole job" concept on the organization and the individual worker. Results of much of this research tended to support a strong positive relationship between these factors and improvements in organizational performance, worker behavior, and worker attitude. All of these factors have been incorporated into the basic structural and functional design of POMO. It would be expected, therefore, that a maintenance activity reorganized

under this concept would experience improvements both in maintenance performance and in the behaviors and attitudes of aircraft maintenance personnel.



## Chapter 3

### METHODOLOGY

The purpose of this chapter is to describe the methodology to be used in conducting a comparative analysis of the impact of POMO on aircraft maintenance within selected tactical fighter wings of the Tactical Air Command (TAC). The chapter begins with a discussion of the general research design followed by an explanation of test and comparison group selection, identification and definition of research variables, sources of data collection, techniques to be used for data analysis, and the data analysis strategy.

#### Overview of Research Design

For the purpose of this current study, an experimental methodology was selected to allow an objective analysis of the stated research hypotheses. Three distinct groups were identified for this experiment; each group was represented by a tactical fighter wing within TAC. One of the three wings was designated as the test group while the others were used as comparison groups.

#### Selection of Test/Comparison Groups

The test group for the current research was an aircraft maintenance activity which had been reorganized under the POMO concept - the 4th Tactical Fighter Wing (TFW) at

Seymour Johnson AFB, North Carolina. This selection was made, with the assistance of HQ-TAC/LGM, by Lieutenant Colonel Denis D. Umstot, Air Force Institute of Technology, and Lieutenant Colonel William E. Rosenbach, Air Force Academy, for their research on the effects of POMO. The 4th TFW had transitioned into POMO during August 1977. Umstot and Rosenbach had also selected two maintenance organizations which were still organized under the specialized maintenance concept of AFM 66-1 as comparison groups; the 31st TFW at Homestead AFB, Florida, and the 388th TFW at Hill AFB, Utah. The involvement of these three units in a POMO-related study prompted the authors to select them for the current research effort. Selection of these units was determined to be consistent with the requirements and objectives of this research.

#### Identification and Definition of Variables

Maintenance performance variables. Through the Maintenance Management Information System, as outlined in the 65-series Air Force Regulations and the 66-200 series Air Force Manuals, management information is identified, collected, and processed for use by maintenance managers. Much of this management information is in the form of quantitative indicators of the quantity and quality of the aircraft maintenance effort. From the many available indicators of maintenance performance, the following variables

were selected because they were considered to be the most important and were expected to show the greatest effects of the POMO reorganization. All references made to "aircraft" in these variables are considered as "unit-possessed aircraft".

1. Flyable Aircraft Rate: The total number of hours that aircraft were available and capable of flying divided by the total number of hours the aircraft were available.

2. Not Mission Capable for Maintenance (NMCM) Rate: The total number of hours aircraft were not capable of flying because of maintenance divided by the total number of hours aircraft were available.

3. Not Mission Capable for Supply (NMCS) Rate: The total number of hours aircraft were not capable of flying because of supply divided by the total number of hours aircraft were available.

4. Scheduling Effectiveness Rate: The number of sorties scheduled and flown divided by the number of sorties scheduled (corrected by subtracting non-chargeable deviations from the schedule from the total sorties scheduled).

5. Abort Rate: Total number of air and ground aborts divided by the total number of sorties scheduled.

6. Cannibalization Rate: The average number of cannibalizations per aircraft.

7. Quality Control Equipment Evaluation Pass Rate:

The number of quality control equipment inspections that passed divided by the total number of equipment inspections performed.

8. Direct Labor Manhour Rate: The number of maintenance manhours spent working directly on aircraft or aircraft-related subsystems divided by the total available manhours.

Behavioral variables. Behavior may be viewed as the response of an individual or group of individuals to a stimulus. Implementation of POMO provided such a stimulus and it was expected to produce an effect on the behaviors of aircraft maintenance personnel. The following variables were expected to be affected by a change such as reorganization of the maintenance activity under the POMO concept.

9. First Term Reenlistment Rate: The number of first term airmen within the maintenance organization who reenlisted divided by the total number of first term airmen in the wing who were eligible to reenlist.

10. Second Term Retention Rate: The number of second term airmen within the maintenance organization who reenlisted divided by the total number of second term airmen in the wing eligible to reenlist.

11. Career Retention Rate: The number of third term or more airmen within the maintenance organization who

reenlisted divided by the total number of third term or more airmen in the wing eligible to reenlist.

12. Retirement Rate: The number of personnel in the maintenance organization who retired divided by the total number of personnel in the wing who retired.

13. Administrative Discharge Rate: The number of maintenance personnel who were given administrative discharges divided by the total number of personnel in the wing given administrative discharges.

14. Quality Control Task Evaluation Pass Rate: The number of individual quality control evaluations of task performance that passed divided by the total number of personnel task evaluations performed.

Attitudinal variables. Attitudes may be considered as personal feelings and perceptions which individuals possess concerning what is happening within themselves and their environment. Since POMO was expected to have an impact on both the aircraft maintenance personnel and their operational environment, it was anticipated that the attitudes of these individuals would be affected. The following research variables allow the evaluation of how personnel attitudes were influenced by POMO.

15. Group Climate: Includes attitudes on rewards, communications, rapport, and structure.

16. Work Group Productivity: Attitudes on the quantity of work performed by the group, the quality and the efficiency of production.

17. Work Group Relations: Attitudes on the group norms; skills; individual and organizational commitment; competition in and between groups; and intergroup and intragroup cooperation.

18. Job Satisfaction: Attitudes on both general and specific satisfaction with the job.

### Data Collection

The data to be used for this research were obtained from two major sources. The data for evaluation of the hypotheses relating to the impact of POMO on maintenance performance and the behaviors of aircraft maintenance personnel were taken from standard reports and administrative records available at the test and comparison bases. The data to be used to evaluate the hypotheses relating to the influence of POMO on the attitudes of maintenance personnel were obtained from two attitudinal surveys which had been administered as part of the Umstot and Rosenbach research study.

### Standard Reports and Administrative Records

Standard reports which contained information on maintenance performance and maintenance personnel behavior were

prepared on a monthly and/or quarterly basis by various base agencies including the aircraft maintenance activity and the wing management analysis office. They were prepared either for required submission to HQ-TAC or for local use by specific base level activities as management tools. The specific data used in this research were obtained during field trips made to Seymour Johnson AFB and Homestead AFB. Subsequent reports, as needed, were made available by responsible base functions. The standard reports used as source documents for research data were:

1. The Monthly Maintenance Data Analysis, RCS: TAC-LGQ(M)7706, Parts I and III. (Prepared by the maintenance organization).
2. The Monthly Statistical Summary. (Prepared by the wing management analysis office).
3. The Monthly and Quarterly Quality Assurance Program Summaries. (Prepared by the quality control office).

In addition, administrative files being maintained by the Consolidated Base Personnel Office (CBPO) also provided research data which were not available in the above standard reports.

Basis for data. In order to obtain data relating to maintenance performance and maintenance personnel behaviors (variables 1-14), reports and records were obtained from two of the sample bases - the test base (Seymour Johnson AFB)

and one of the comparison bases (Homestead AFB). The original research design called for data to be obtained for all variables for the period January 1977 through April 1978. The April 1978 cutoff for data compilation was necessary because the maintenance activity at Homestead AFB was reorganized under POMO during May 1978. Once this transition was made, Homestead no longer met the requirements of a valid comparison base for the purpose of this research. With the exception of quality control equipment evaluation rate (variable #7), retirement rate (variable #12), and quality control task evaluation pass rate (variable #14), all data for the required period were available and used during this research effort. Periods of data availability have been summarized in Table 1. A complete summary of all data obtained from the test and comparison bases is presented in Appendix A.

#### Attitudinal Surveys

An attitudinal survey, entitled Job Attitude Survey (Appendix B), was developed by Umstot and Rosenbach for use in their research. The data obtained from that survey instrument were also used as inputs to this current research. This information provided the basis for evaluation of the attitudinal impact of POMO on aircraft maintenance personnel.

Basis for data. In order to obtain data relating to maintenance personnel attitudes (variables 15-18),



TABLE 1

PERIODS OF DATA AVAILABILITY FROM TEST/COMPARISON GROUPS  
(MAINTENANCE PERFORMANCE AND PERSONNEL BEHAVIOR ONLY)

Number	Variable Name	Seymour Johnson AFB		Homestead AFB	
		From	To	From	To
1	Flyable Aircraft Rate	Jan 77	Apr 78	Jan 77	Apr 78
2	NMCM Rate	Jan 77	Apr 78	Jan 77	Apr 78
3	NMCS Rate	Jan 77	Apr 78	Jan 77	Apr 78
4	Scheduling Effectiveness Rate	Jan 77	Apr 78	Jan 77	Apr 78
5	Abort Rate	Jan 77	Apr 78	Jan 77	Apr 78
6	Cannibalization Rate	Jan 77	Apr 78	Jan 77	Apr 78
7	Equipment Evaluation Pass Rate	Nov 77	Mar 78	Sept 77	Mar 78
8	Direct Labor Manhour Rate	Jan 77	Apr 78	Jan 77	Apr 78
9	First Term Reenlistment Rate	Jan 77	Apr 78	Jan 77	Apr 78
10	Second Term Retention Rate	Jan 77	Apr 78	Jan 77	Apr 78
11	Career Retention Rate	Jan 77	Apr 78	Jan 77	Apr 78
12	Retirement Rate	Feb 77	Apr 78	Dec 77	Apr 78
13	Administrative Discharge Rate	Jan 77	Apr 78	Jan 77	Apr 78
14	Task Evaluation Pass Rate	Sept 77	Mar 78	Sept 77	Apr 78

attitudinal surveys were completed by maintenance personnel at all three of the sample bases - Seymour Johnson AFB, Homestead AFB, and Hill AFB. Table 2 provides a summary of how surveys administered to the test and comparison bases were distributed, scored, and matched. During July 1977, a total of 800 surveys were distributed to Seymour Johnson AFB and 700 surveys each to Homestead AFB and Hill AFB. Instructions accompanied these initial surveys requesting that they be randomly administered during duty hours to aircraft maintenance personnel who had been on base for approximately one year. The returned surveys were subsequently scored at the Air Force Academy. A total of 505, 404, and 347 useable surveys were provided from Seymour Johnson, Homestead, and Hill respectively.

During March 1978, approximately 600 copies of the same survey instrument were distributed to each of the bases. Instructions provided requested that they be administered, to the maximum extent possible, to the same groups of maintenance personnel who had completed the initial survey. Lists of these maintenance personnel were provided to each base to assist in the matching process. Completed surveys were again scored at the Air Force Academy and paired to the first set of survey responses by comparison of social security numbers of the respondents. This matching operation yielded 196 sets of paired data from Seymour Johnson AFB;

TABLE 2

SUMMARY OF ATTITUDINAL SURVEYS ADMINISTERED  
TO SEYMOUR JOHNSON AFB, HOMESTEAD AFB,  
AND HILL AFB

Survey I (July 77)	Number of Surveys Distributed	Surveys Returned and Scored
Seymour Johnson AFB	800	505
Homestead AFB	700	404
Hill AFB	700	347

Survey II (Mar 78)	Number of Surveys Distributed	Surveys Returned, Scored, and Paired
Seymour Johnson AFB	600*	196**
Homestead AFB	600*	112**
Hill AFB	600*	72**

\* Approximate Number

\*\* Paired Cases

112 sets from Homestead AFB; and 72 sets from Hill AFB. The data contained in these final sets of matched surveys were used for all subsequent analysis.

Demographic features of the survey sample. Table 3 shows the composition of the survey respondents which composed the matched cases. Features which were considered in this summary included age, rank, supervisor (yes/no), and sex (female/male).

TABLE 3

## DEMOGRAPHIC DATA ON SURVEY RESPONDENTS

	Seymour Johnson AFB		Homestead AFB		Hill AFB	
Age	Number	% of Sample	Number	% of Sample	Number	% of Sample
18-22	100	51.0	58	51.8	36	50.0
23-30	63	32.1	35	31.3	18	25.0
31-40	26	13.3	17	15.2	17	23.6
41-up	7	3.6	1	.9	1	1.4
Rank	Number	% of Sample	Number	% of Sample	Number	% of Sample
E1-E4	142	72.5	73	65.2	47	65.3
E5-E6	41	20.9	29	25.9	16	22.2
E7-E9	11	5.6	9	8.0	8	11.1
OFF-CIV*	2	1.0	1	.9	1	1.4
Supervisor	Number	% of Sample	Number	% of Sample	Number	% of Sample
Yes	61	31.1	47	42.0	27	37.5
No	135	68.9	65	58.0	45	62.5
Sex	Number	% of Sample	Number	% of Sample	Number	% of Sample
Female	10	5.1	7	6.3	2	2.8
Male	186	94.9	105	93.7	70	97.2
Total Number In Sample	196		112		72	

\* Includes officers and civilians of all grades.

Possible bias in survey sample? The demographic data displayed in Table 3 show a relatively consistent distribution of respondents from the three bases. Based upon a subjective evaluation of the features considered, there was no reason to believe that any bias had been introduced through composition of dissimilar groups. There are, however, two potential sources of bias. One source could have been introduced through the selection of groups of maintenance personnel from different geographic locations. This problem, however, was dictated by the design of the research. The second source of potential bias could have been introduced during the initial selection of maintenance personnel to participate in the attitudinal survey. One of the instructions provided with the survey instrument which was initially distributed was that it should be administered only to personnel who had been on station for approximately one year. Final analysis of the responses from these individuals was limited to those who completed both the pre-POMO survey (July 77) and the post-POMO survey (Mar 78). Therefore, this final group of individuals identified for use in the analysis may not be truly representative of the population of the test/comparison bases. It is hoped that over the range of time and the number of variables evaluated during this study, that these sources of potential bias have been minimized.

## Techniques of Data Analysis

For this research effort, four statistical techniques were identified for selective application in the analysis of the data. Variables relating to maintenance performance and maintenance personnel behaviors (variables 1-14) were evaluated using two of these four statistical techniques. These were: Analysis of Variance (ANOVA), and Chi Square Goodness of Fit Test. The variables which related to personnel attitudes were evaluated using the remaining two techniques: Factor Analysis, and Analysis of Covariance.

### Oneway Analysis of Variance (ANOVA)

Analysis of variance is a technique used to test the hypotheses that statistical equivalence exists between the means of two or more populations. This test is conducted by using the sample value means to estimate the variance of the population. This estimate is subsequently compared to an estimate of the population variance computed from differences between individual elements of the sample with an F-distribution used to perform the actual test. The assumptions made in the application of this statistical technique were that the populations are normally distributed and the variance of the populations being evaluated were approximately equal.

As applied to this research, oneway analysis of variance was used to determine if there was a statistically significant difference between the mean of a variable's values before the implementation of POMO at the test base (Aug 77) and the mean of those values after that time. This technique was, therefore, applied to all the data within the test group for each variable. The F-statistic calculated by this technique, when compared to a preselected F-distribution critical value, was then used to determine statistical significance.

Level of significance. For the purpose of this research, the hypothesis that the means of the variable values were the same both for the pre-POMO and post-POMO periods and between the test and comparison groups was rejected if the F-statistic was at a significant level of .05 or less.

#### Chi Square Goodness of Fit Test

The purpose of the chi square test was to test a sample to see if it could have come from some hypothesized distribution. The shape of this distribution was compared to the shape of the sample distribution by using the non-parametric chi square ( $\chi^2$ ) statistic.

In this research the distribution of variable values in the comparison group (Homestead AFB) over time were compared to the corresponding variable values in the test group (Seymour Johnson AFB) to determine if the distributions were

the same. Significant differences were identified by comparing the computed chi square statistic with the appropriate chi square critical value ( $\chi^2_c$ ). The chi square test was determined to be appropriate when the numbers used in calculating a particular variable's values were small, thus producing large variances in the calculated percentage values.

Level of significance. For the purpose of this research, the chi square critical value was chosen at the .05 level of significance. If the calculated chi square test statistic exceeded the critical value, the hypothesis that the groups had the same distribution was rejected.

#### Factor Analysis

The data used for evaluation of personnel attitudes were obtained from the Job Attitude Survey. This survey consisted of 130 statements from which a total of 53 were identified as being related to the variables of this research effort. Factor analysis was applied to the data whereby highly related statements were grouped together into single factors. This statistical process attempted to create a new factor or variable for each group of highly correlated statements. Then, each new factor could be substituted for the corresponding group of correlated statements in subsequent analysis of the data.

Factor analysis was conducted on all of the initial POMO survey responses (Survey #1). A total of 1256 surveys



were used from the test and comparison groups. The final number of factors which were used in this research was determined by specifying that the eigenvalue (a measure of the total variance existing in the new factor) for each factor be equal to or greater than 1.0. Each of the 53 survey statements was placed into a particular factor grouping if the factor loading was 0.4 or better. The results of this factor analysis produced 12 factors which used 51 of the 53 statements. The remaining 2 statements did not display a sufficiently high factor loading to allow loading into any single factor. The factor structure with derived factor names and related survey statements are presented in Table 4.

In the Job Attitude Survey, respondents were requested to evaluate the statements provided and select one numerical value for each from a scale of 1 to 7. The value selected represented their feelings relating to the statement context. In order to provide an aggregated value for each factor used during subsequent analysis, the numerical values of the statements in each factor were summed and, then, divided by the number of statements in the factor. This process produced a scored aggregate value for each of the 12 new factor variables created by the factor analysis. These factor values were then used in the analysis of covariance.

TABLE 4  
 FACTOR BREAKDOWN STRUCTURE

Factor	Statements (see Appendix )
1. Group Climate	
A. Rewards	44,47,75,77,79
B. Communications and Rapport	38,39,40,42,43,45,48
C. Structure	41,49,50
2. Work Group Productivity	51,52,53
3. Work Group Relations	
A. Commitment and Competition	58,59,61,65,69
B. Organizational Commitment	105,106,108
C. Skills	55,57,60,68,70
D. Norms	56,64,67,73
E. Intragroup Cooperation	54,62,63,72
F. Intergroup Cooperation	66,71,74
4. Job Satisfaction	
A. General Satisfaction	76,78,80
B. Specific Satisfaction	81,82,83,84,85,86

Analysis of Covariance

It would be possible by application of analysis of variance, as previously described, to determine the effects of a particular treatment on a test group as compared to one or more comparison groups. This technique, however, produces a fairly large experimental error. Analysis of

covariance is one method that can be used to reduce this experimental error. This technique uses the relationship between the dependent variable (post-POMO survey scores) and an independent variable (pre-POMO survey scores) to reduce the experimental errors in the data. The use of regression relationships in covariance analysis may be thought of as an indirect means of controlling experimental error.

In applying analysis of covariance to this research, the post-POMO survey score was regressed against the pre-POMO survey score for each factor using the following multiple linear regression (MLR) model equation.

$$Y = b_0 + b_2D1 + b_3D2 + b_1X$$

Where

Y = post-POMO survey score

D1 = 1 if data was from Homestead AFB

D2 = 1 if data was from Seymour Johnson AFB

X = pre-POMO survey score

$b_0$  = Y-intercept

$b_1$  = slope of regression line

$b_2$  = difference in Y-intercept from  $b_0$  for D1

$b_3$  = difference in Y-intercept from  $b_0$  for D2

The baseline equation  $Y = b_0 + b_1X$  represented the regression line for the factor values from Hill AFB. The dummy variables D1 and D2 simply allowed the model to differentiate between the three groups.

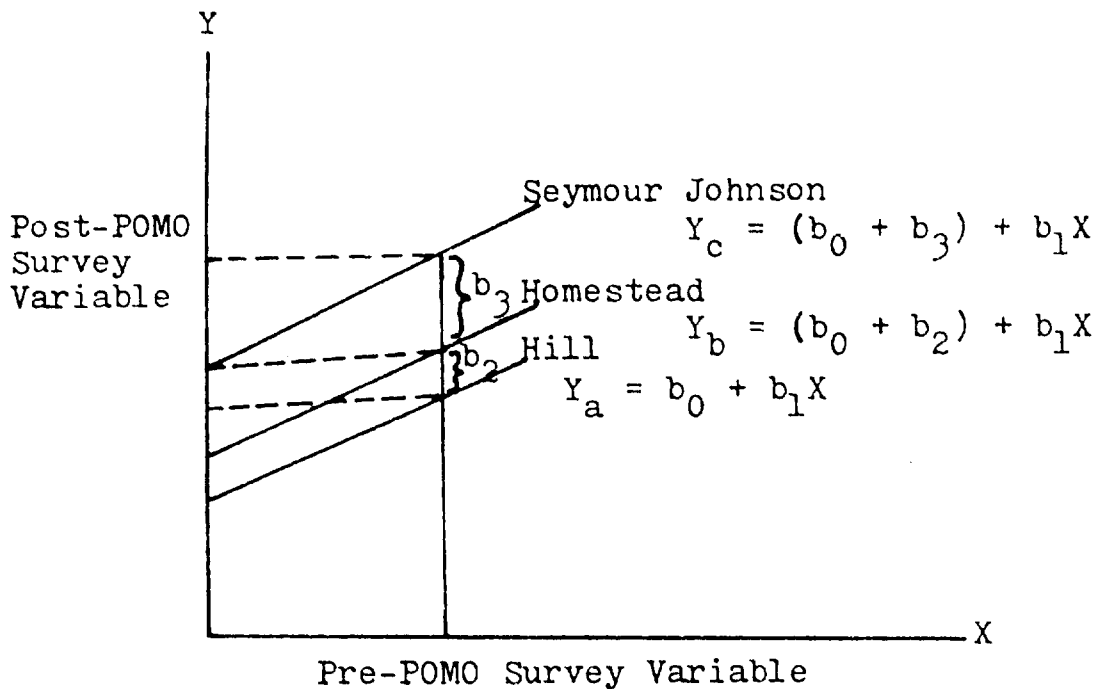


Figure 6. Analysis of Covariance

Figure 6 shows the relationships which could be established using this MLR model. It should be noted that this model produced a series of parallel lines with each line representing either a test or comparison group. The distances between the lines represented the true differences in the post-POMO survey data caused by the implementation of POMO at Seymour Johnson AFB.

This MLR model, however, assumed that there was no interaction between the variable values of one group with those of another group. In order to evaluate this assumption, interactive terms were added to the model to produce a "saturated" MLR model represented by the following formula:

$$Y = b_0 + b_2 D1 + b_3 D2 + b_1 X + b_4 D1X + b_5 D2X$$

where:

$D1X = D1 \text{ times } X$

$D2X = D2 \text{ times } X$

The Statistical Package for Social Sciences (SPSS) computer program for multiple linear regression (Nie, 1975, pp.320-367) was used to evaluate each of the 12 factors using this "saturated" model equation. The statistics produced by this program were then used to determine the significance of the POMO test at Seymour Johnson AFB when compared to the comparison groups and the extent of any interactions.

Level of significance. In the analysis of covariance, the interactive terms (D1X, D2X) were not considered significant if the level of significance was .05 or below. In addition, the group terms (D1, D2) were not considered to be significant if the level of significance was .05 or below. These significant levels were selected as being appropriate for the nature and purpose of this research effort.

#### Strategy of Data Analysis

The large number of variables considered during this research required that the process to be used in their evaluation and analysis be clearly defined. A stepwise process was used whereby all of the variables were evaluated in a systematic manner. This strategy insured that each variable

was accurately and equitably evaluated and that the required statistical techniques were applied to each. Figure 7 presents a decision tree of this strategy showing the manner in which variables are to flow through the process.

Due to the differences in the nature and type of variables, it was necessary to divide them into two distinct categories. The first category, consisting of variables 1-14, included those which related to maintenance performance and the behaviors of aircraft maintenance personnel. The second category, composed of variables 15-18, consisted of those which related to the attitudes of maintenance personnel.

Category 1: Variables  
Relating to Maintenance  
Performance and Personnel  
Behavior

The initial step in the strategy for analysis of the variables in this category was to determine which statistical technique, if any, was to be applied. The chi square test was considered appropriate if monthly data values used in evaluating the percentage rates for research variables were small (i.e. average less than 15). ANOVA was applicable if the monthly data values were relatively large (i.e. average of 15 or greater). Where data was not available for the period prior to the implementation of POMO at Seymour Johnson AFB, no statistical technique was considered to be appropriate.

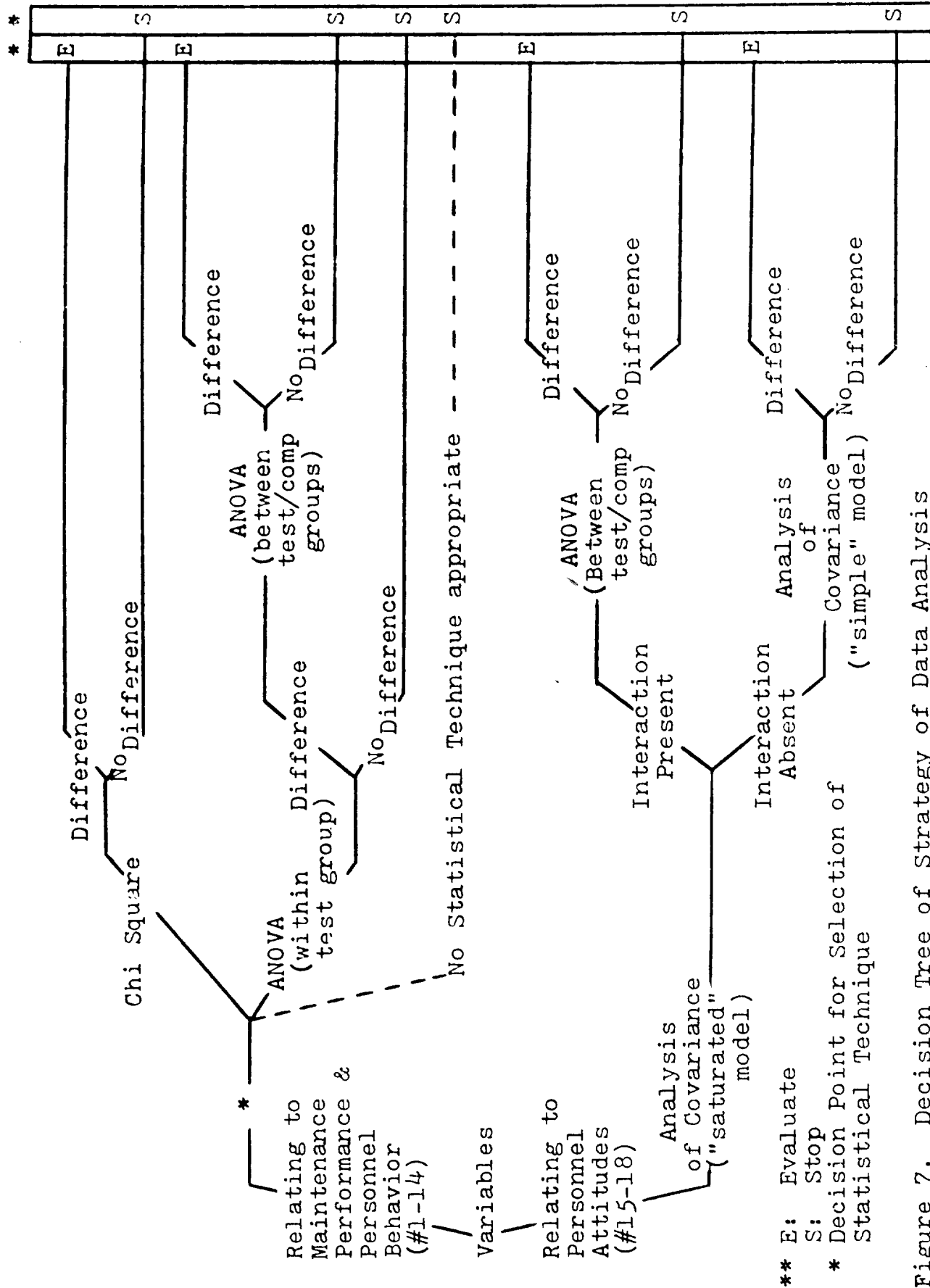


Figure 7. Decision Tree of Strategy of Data Analysis

Chi square test. For those variables whose monthly data values were small, the values were to be aggregated into three time periods for each of the test and comparison groups. The chi square test was then applied to these aggregate time periods. If a significant difference was found to exist, the variables were further evaluated to determine the possible causes for this difference. If no such difference was noted, the test and comparison groups were assumed to have equal distribution of their data values.

Analysis of variance. Analysis of variance (ANOVA) was to be applied directly to the calculated percentage rates for each variable whose monthly data values averaged 15 or greater. This analysis was first performed on only the test group (Seymour Johnson) and compared the means ( $\bar{X}$ ) of the variable data values before the implementation of POMO to those means after POMO. If no significant difference existed between the two periods, the variable mean values were considered to be equal. If such a significant difference was noted, the variable values for the test group (Seymour Johnson) were further evaluated using a second ANOVA. This additional statistical analysis evaluated variable values from the test group with comparable values from the comparison group (Homestead). This second ANOVA was performed on data from both the test and comparison groups. The mean of the data values for the test group obtained from



implementation of POMO was compared to the mean value from Homestead. This same analysis was repeated for the variable means after POMO implementation. If analysis results showed differences which were statistically significant, additional evaluation was performed to determine their possible causes. If no differences existed, a comparable change in the variable data means, both before and after POMO implementation, was considered to have occurred at both Seymour Johnson and Homestead.

No statistical technique appropriate. For those variables where data were unavailable prior to implementation of POMO at Seymour Johnson (August 1977), no statistical techniques were used in their evaluation.

Category 2: Variables  
Relating to Personnel  
Attitudes

The 12 factors which constitute these variables were initially analyzed using the "saturated" multiple linear regression (MLR) model of analysis of covariance. Based upon the results of this analysis, it was determined if any statistically significant interaction existed between the test and comparison groups due to the data obtained. If interaction was noted, "simple" analysis of covariance was not the correct statistical technique to be used and an ANOVA was performed on the mean of the data values between the test (Seymour Johnson) and the comparison (Homestead/Hill)

groups. If the results of the ANOVA showed that a statistically significant difference existed in these values, further evaluation was performed to determine their causes. If ANOVA results failed to indicate that such a difference existed, it was concluded that there was no significant effect on the factor due to the implementation of POMO. For those cases where the factors being evaluated showed no statistically significant interaction between the test and comparison groups, "simple" analysis of covariance was applied. For those cases where analysis results showed that a statistically significant difference existed, additional evaluation was performed to determine their possible causes. When "simple" analysis of covariance revealed no such difference, it was concluded that, for that factor, there was no significant effect on the test group (Seymour Johnson) due to the implementation of POMO.

### Summary

The purpose of this chapter was to provide a description of the methodology and the analysis to be used in determining the impact of POMO on the aircraft maintenance organization. Three bases within TAC were selected to comprise the test and comparison groups. Since Seymour Johnson AFB was reorganized under the POMO concept during August 1977, it was selected as the test group/base. Homestead AFB and Hill AFB, still organized under the specialized maintenance

concept of AFM 66-1, were selected as comparison group/bases. A total of 18 research variables were identified in this research for evaluating the impact of POMO on maintenance performance and the behaviors/attitudes of aircraft maintenance personnel.

Data for the maintenance performance and behavioral variables were provided from Seymour Johnson and Homestead using existing reports and administrative files. Data for the personnel attitudinal variables were provided from the results of the Job Attitude Survey which was administered to groups of maintenance personnel at Seymour Johnson AFB, Homestead AFB, and Hill AFB. Various statistical techniques were applied to this data in order to aid in evaluating the research hypotheses. These techniques included: Analysis of Variance (ANOVA), Chi Square Goodness of Fit Test, Factor Analysis, and Analysis of Covariance (ACOVA).

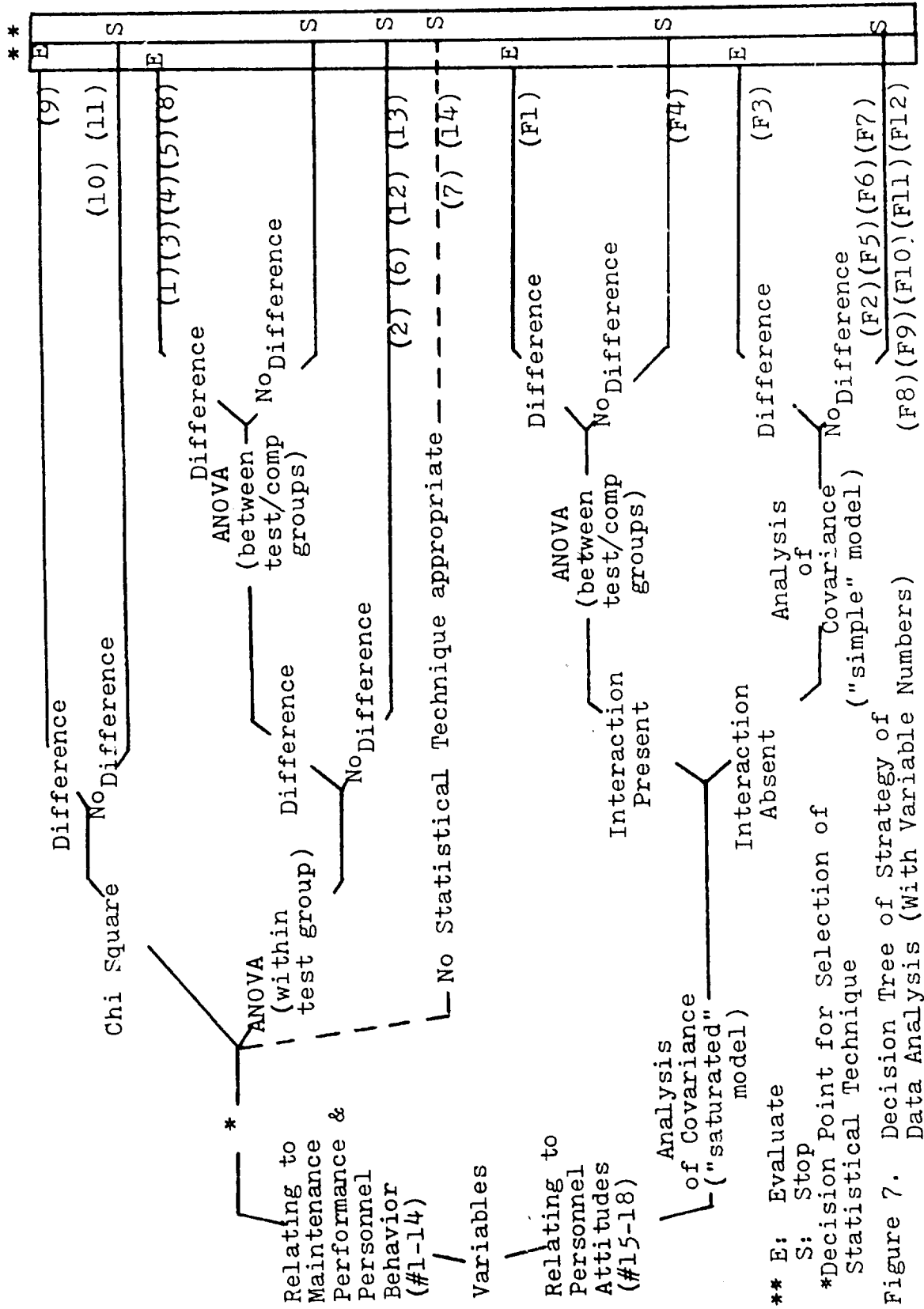
## Chapter 4

### DATA ANALYSIS AND RESULTS

The comprehensive evaluation of the data obtained from the test/comparison groups and the attitudinal surveys provide significant insight into the effects of POMO on the aircraft maintenance organization. This chapter discusses the analysis which is performed on the data as well as the final results which are obtained from this analysis. The chapter is divided into four sections. The first section presents a general overview of the manner in which the data is grouped and analyzed. The second presents the results of the analysis of the variables relating to maintenance performance and the behavior of aircraft maintenance personnel. The third section presents the results of the analysis of the variables relating to personnel attitudes. The chapter concludes with a summary of all analysis results.

#### Overview of Data Analysis

The analysis of the data (Appendix A) followed the strategy outlined in the previous chapter. The strategy decision tree is repeated in Figure 8 to show the results of the strategy as applied to each of the variables. The variables have been grouped by the statistical technique to be used in their evaluation and analysis.



The chi square test was determined to be applicable for three of the research variables: Variable 9 -- First Term Reenlistment Rate, Variable 10 -- Second Term Retention Rate, and Variable 11 -- Career Retention Rate. Analysis of variance (ANOVA) was determined to be applicable for nine of the variables: Variable 1 -- Flyable Aircraft Rate, Variable 2 -- Not Mission Capable for Maintenance (NMCM) Rate, Variable 3 -- Not Mission Capable for Supply (NMCS) Rate, Variable 4 -- Scheduling Effectiveness Rate, Variable 5 -- Abort Rate, Variable 6 -- Cannibalization Rate, Variable 8 -- Direct Labor Manhour Rate, Variable 12 -- Retirement Rate, and Variable 13 -- Administrative Discharge Rate. No statistical technique was determined to be appropriate for two research variables: Variable 7 -- Quality Control Equipment Evaluation Pass Rate and Variable 14 -- Quality Control Personnel Evaluation Pass Rate since data was not available for them prior to the implementation of POMO.

As indicated in Chapter 3, the variables relating to personnel attitudes, variables 15-18, were subdivided into 12 factors for this research. Of these 12 factors, only Factor F1 (Rewards) and Factor F4 (Productivity) showed interactive terms which were statistically significant precluding use of analysis of covariance for their evaluation. These factors were evaluated, therefore, using ANOVA. The remaining 10 factors were analyzed by analysis of covariance.

Variables Relating to Main-  
tenance Performance and  
Personnel Behavior

Application of the Chi Square  
Test to Reenlistment and  
Retention Rates

In the evaluation of variables relating to reenlistment and retention of maintenance personnel, it was found that only Variable 9 (First Term Reenlistment Rate) showed a statistically significant difference in the distribution of values between the test group (Seymour Johnson) and the comparison group (Homestead). The distribution data values and resulting statistics from this analysis are presented in Table 5. This table shows that Seymour Johnson experienced a significant decrease in the first term reenlistment rate after implementation of POMO which was not matched at Homestead. Therefore, it is possible that POMO caused a significant effect on the reenlistment rate at Seymour Johnson. The change in reenlistment rates at both bases for the months July-September 1977 was attributed to the effect of an Air Force Early Out Program offered during August 1977.

Application of Analysis of  
Variance (ANOVA) to Perform-  
ance and Behavior Indicators

When ANOVA was applied to the nine variables to be evaluated using this statistical technique, five were determined to have statistically significant differences in the means of the variable values before and after POMO for

TABLE 5

RESULTS OF CHI SQUARE TEST APPLIED TO  
REENLISTMENT AND RETENTION RATES

## Variable 9: First Term Reenlistment Rate

	Pre-Test (Jan-Jun 77)	Middle (Jul-Sep 77)	Post-Test (Oct 77-Apr 78)
Seymour Johnson	52*	15	34
Homestead	41	24	60

$$\chi^2_r = 8.11$$

$$df = 2$$

$$\text{Level of Significance} = .017$$

## Variable 10: Second Term Retention Rate

	Pre-Test (Jan-Jun 77)	Middle (Jul-Sep 77)	Post-Test (Oct 77-Apr 78)
Seymour Johnson	78	71	81
Homestead	53	83	83

$$\chi^2_r = 5.46$$

$$df = 2$$

$$\text{Level of Significance} = .065$$

## Variable 11: Career Retention Rate

	Pre-Test (Jan-Jun 77)	Middle (Jul-Sep 77)	Post-Test (Oct 77-Apr 78)
Seymour Johnson	100	94	100
Homestead	94	92	100

$$\chi^2_r = .097$$

$$df = 2$$

$$\text{Level of Significance} = .953$$

$$* \frac{\# \text{ Reenlisted/Retained}}{\# \text{ Eligible}} \times 100$$



Seymour Johnson. Analysis results from applying the initial ANOVA are presented in Table 6. This table shows that those variables reflecting such a difference were Variable 1 (Flyable Aircraft Rate), Variable 3 (Not Mission Capable for Supply Rate), Variable 4 (Scheduling Effectiveness Rate), Variable 5 (Abort Rate), and Variable 8 (Direct Labor Man-hour Rate). Since the results of this analysis showed that a significant difference existed before and after POMO for these variables at Seymour Johnson (test group), a second ANOVA was applied to these variables to determine if any significant differences existed between Seymour Johnson and Homestead for the periods before and after POMO. The before-POMO data from these bases were evaluated separately from that which had been obtained after POMO implementation. The results of this analysis are presented in Table 7. Based upon the results of this second ANOVA, these same five variables showed a statistically significant difference either for the period before POMO or after POMO (or both). These findings, used in conjunction with a graph prepared for each variable's data, provided the basis for subsequent evaluation as to possible causes for these differences.

Variable 1: Flyable Aircraft Rate. The graph for this variable, Figure 9, and ANOVA analysis results presented in Table 6 indicate that a significant decrease in the flyable aircraft rate occurred at Seymour Johnson after

TABLE 6

ONEWAY ANOVA APPLIED TO MAINTENANCE PERFORMANCE  
AND PERSONNEL BEHAVIOR INDICATORS

Variable Name/ Number	<u>Mean(Before)</u>	<u>Mean(After)</u>	<u>TSS<sup>1</sup></u>	<u>ESS<sup>2</sup></u>	<u>SS<sup>3</sup></u>	<u>df<sup>4</sup></u>	<u>F<sup>5</sup></u>	<u>Ls<sup>6</sup></u>
Flyable Aircraft Rate/Variable 1	72.70	65.40	209.83	167.76	377.59	1,14	17.51	.001
NMCM Rate/ Variable 2	25.51	27.18	10.90	103.10	114.00	1,14	1.48	NS*
NMCS Rate/ Variable 3	1.79	7.41	124.60	88.32	212.92	1,14	19.75	.001
Scheduling Effectiveness Rate/Variable 4	84.03	79.44	82.74	217.26	300.00	1,14	5.33	.037
Abort Rate/ Variable 5	2.77	4.73	15.18	11.56	26.74	1,14	18.39	.001
Cannibalization Rate/Variable 6	2.70	3.08	.56	12.82	13.38	1,14	.61	NS
Direct Labor Manhour Rate/ Variable 8	46.31	57.19	465.64	493.68	959.32	1,14	13.20	.003

Continued

TABLE 6 (Continued)

Variable Name/ Number	Mean(Before)	Mean(After)	TSS <sup>1</sup>	ESS <sup>2</sup>	SS <sup>3</sup>	df <sup>4</sup>	F <sup>5</sup>	LS <sup>6</sup>
Retirement Rate/Variable 12	21.87	23.68	11.81	1547.19	1559.00	1,13	.10	NS
Administrative Discharge Rate/ Variable 13	44.76	41.40	44.54	4109.50	4154.04	1,14	.15	NS

- 1 - TSS: Treatment Sum of Squares
  - 2 - ESS: Error Sum of Squares
  - 3 - SS: Total Sum of Squares
  - 4 - df: degrees of freedom
  - 5 - F: F-Statistic
  - 6 - LS: Level of Significance
- \* Not Significant

TABLE 7

TWO-WAY ANOVA APPLIED TO MAINTENANCE PERFORMANCE  
AND PERSONNEL BEHAVIOR INDICATORS

Variable Name/ Number	Period	Mean	CSS <sup>1</sup>	RSS <sup>2</sup>	TSS <sup>3</sup>	df <sup>4</sup>	F <sup>5</sup>	LS <sup>6</sup>	F <sup>7</sup>	LS <sup>8</sup>
Flyable Aircraft Rate/Variable 1	Before	68.73	201.94	220.02	599.73	1,6	7.43	.034	1.13	NS*
	After	64.61	57.28	6.72	180.91	1,8	.49	NS	.34	NS
NMCS Rate/ Variable 3	Before	3.95	8.34	65.58	80.64	1,6	58.58	.000	1.24	NS
	After	8.06	117.22	7.61	153.12	1,8	2.15	NS	4.14	NS
Scheduling Effectiveness Rate/variable 4	Before	79.95	131.68	232.89	539.66	1,6	7.98	.030	.75	NS
	After	76.09	65.01	202.68	691.94	1,8	3.82	NS	.15	NS
Abort Rate/ Variable 5	Before	3.42	2.60	5.94	11.10	1,6	13.93	.010	1.02	NS
	After	6.10	18.07	33.51	78.42	1,8	9.99	.013	.67	NS

Continued

TABLE 7 (Continued)

Variable Name/ Number	Period	Mean	CSS <sup>1</sup>	RSS <sup>2</sup>	TSS <sup>3</sup>	df <sup>4</sup>	F <sup>5</sup>	LS <sup>6</sup>	F <sup>7</sup>	LS <sup>8</sup>
Direct Labor Manhour Rate/ Variable 8	Before	54.34	208.79	902.41	1567.83	1,6	11.86	.014	.46	NS*
	After	61.54	745.00	341.47	1892.00	1,8	3.39	NS	.92	NS

1 - CSS: Column Sum of Squares

2 - RSS: Row Sum of Squares

3 - TSS: Total Sum of Squares

4 - df: degrees of freedom

5 - F: F-statistic for between groups

6 - LS: Level of Significance for F<sup>5</sup>

7 - F: F-statistic for between data values

8 - LS: Level of Significance for F<sup>7</sup>

\* Not Significant

implementation of POMO. Figure 9 and Table 7 further show that the flyable aircraft rates after implementation of POMO were approximately the same for both bases. Homestead, however, began with a significantly lower rate during the period prior to POMO than did Seymour Johnson. It is apparent that Seymour Johnson did experience some degradation in their flyable aircraft rate that could be attributed to POMO. Another possible cause which could have attributed to the reduction might have been the changes in reporting aircraft status which occurred during October 1977. At that time, aircraft reporting was redefined whereby aircraft were classified as being either Fully Mission Capable (FMC), Partially Mission Capable (PMC), or Not Mission Capable (NMC). It was determined during the course of this research that a small percentage of aircraft which were previously classified as Operationally Ready (OR) under the old reporting system were neither Fully Mission Capable nor Partially Mission Capable under the new system. Therefore, some reduction (e.g. 3-5 percent) might be attributed to this reporting change. The observation, however, that the decrease was noted only at Seymour Johnson tended to support the contention that POMO at least contributed to the reduced flyable aircraft rate at that base after POMO implementation.

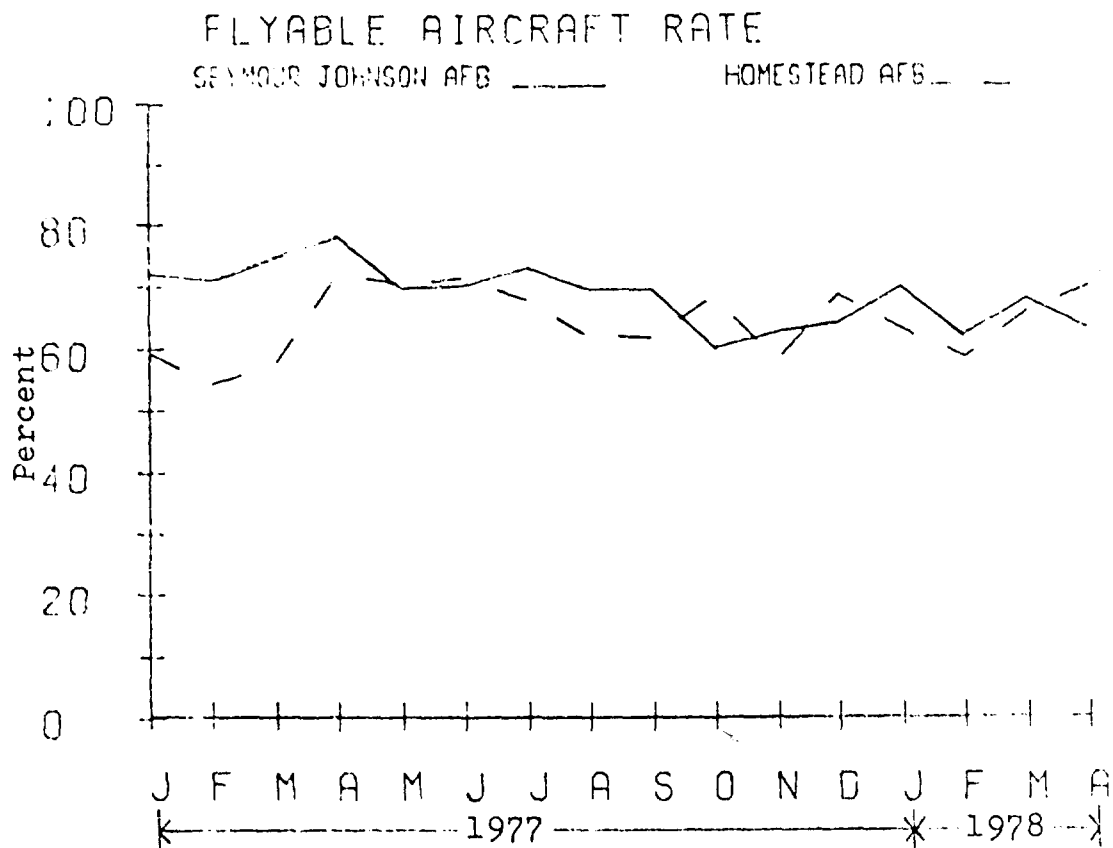


Figure 9. Graph of Data Values for Flyable Aircraft Rate (Variable 1)

Variable 3: Not Mission Capable for Supply (NMCS) Rate. The graph presented in Figure 10 and ANOVA analysis results in Table 6 show that a significant increase in the NMCS rate occurred at Seymour Johnson after the implementation of POMO. This graph and Table 7 further indicate that the NMCS rates at both bases were approximately equal after POMO was implemented at Seymour Johnson. Homestead, however, had experienced a significantly higher rate prior to POMO than did Seymour Johnson. While both bases had an increase in the NMCS rate after POMO, Seymour Johnson showed the

greater increase. While other factors, such as possible changes in reporting procedures could have caused the increase at both bases, the increase at Seymour Johnson might be at least in part due to the implementation of POMO.

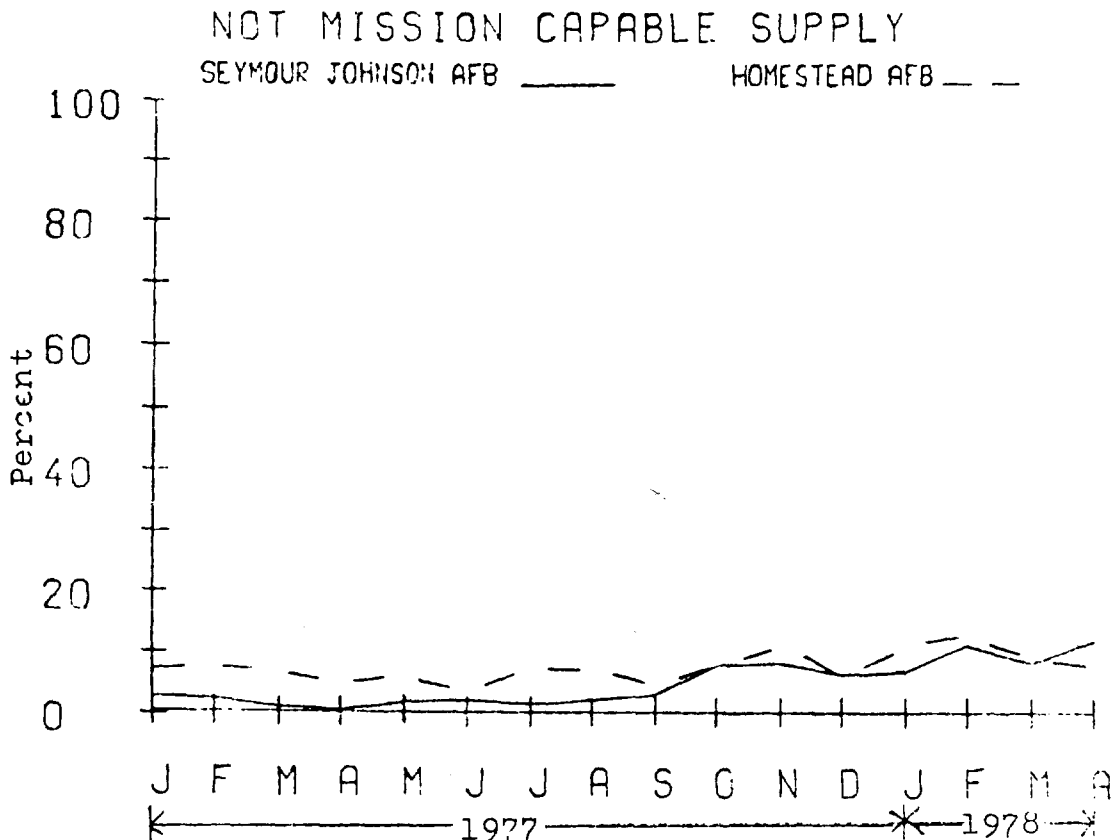


Figure 10. Graph of Data Values for Not Mission Capable for Supply (NMCS) Rate (Variable 3)

Variable 4: Scheduling Effectiveness Rate. The graph presented in Figure 11 and ANOVA analysis results in Table 6 show that a significant decrease in the scheduling effectiveness rate occurred at Seymour Johnson after implementation of POMO. This graph and Table 7 also indicate that the means of the scheduling effectiveness rates at the



two bases are approximately equal during the period after POMO implementation. Homestead, however, experienced a mean rate which was significantly lower than Seymour Johnson for the period before POMO. Therefore, it is possible that the decrease in the scheduling effectiveness rate experienced by Seymour Johnson was caused by POMO.

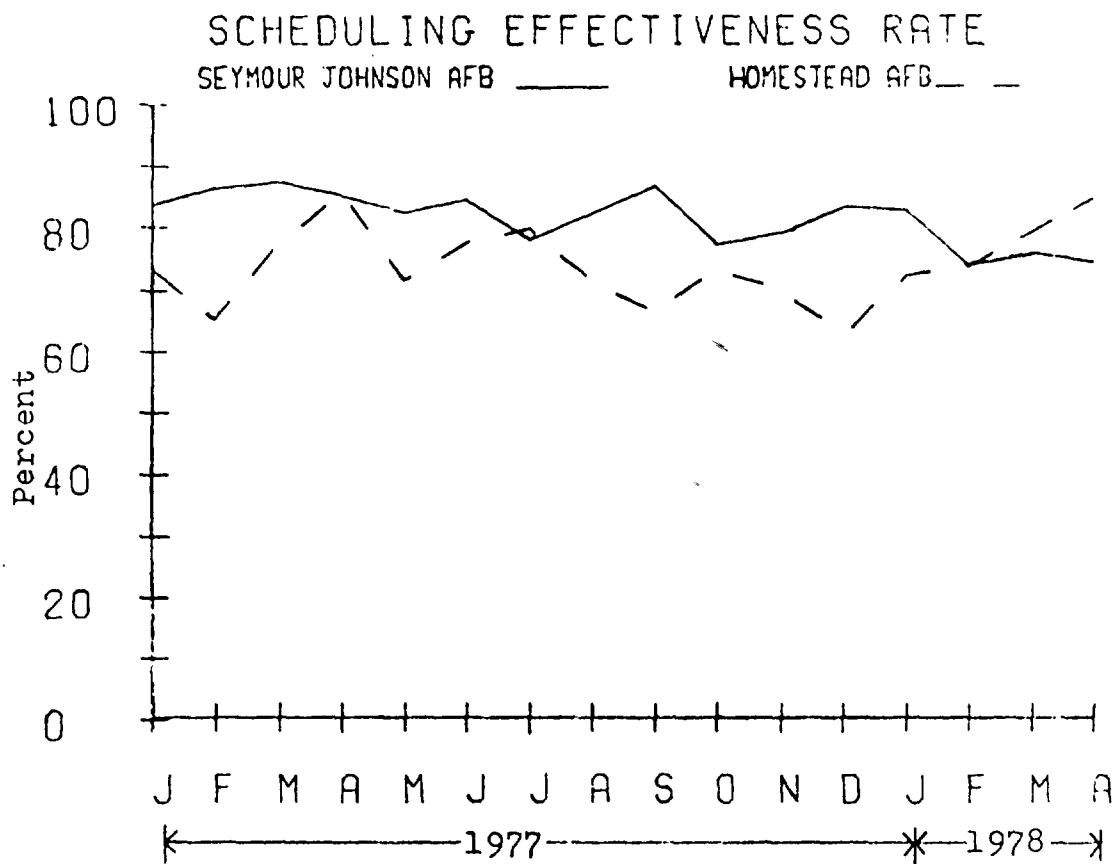


Figure 11. Graph of Data Values for Scheduling Effectiveness Rate (Variable 4)

Variable 5: Abort Rate. The graph for this variable, Figure 12, and ANOVA analysis results presented in Table 6 show that a significant increase in the abort rate occurred at Seymour Johnson after implementation of POMO.

This graph and Table 7 further indicate that significant differences exist in the abort rates between the two bases for the periods both before and after POMO. Figure 12 shows that Homestead had a consistently higher abort rate than Seymour Johnson throughout the entire period of the data. In addition, Homestead shows an increase in the abort rate during the period after POMO that exceeds the rate increase experienced at Seymour Johnson. Whereas, Seymour Johnson did show an abort rate which significantly increased after POMO, so did Homestead. Therefore, while the increased rate at Seymour Johnson may have been effected in part, by POMO, another factor or factors may also be influencing these rates.

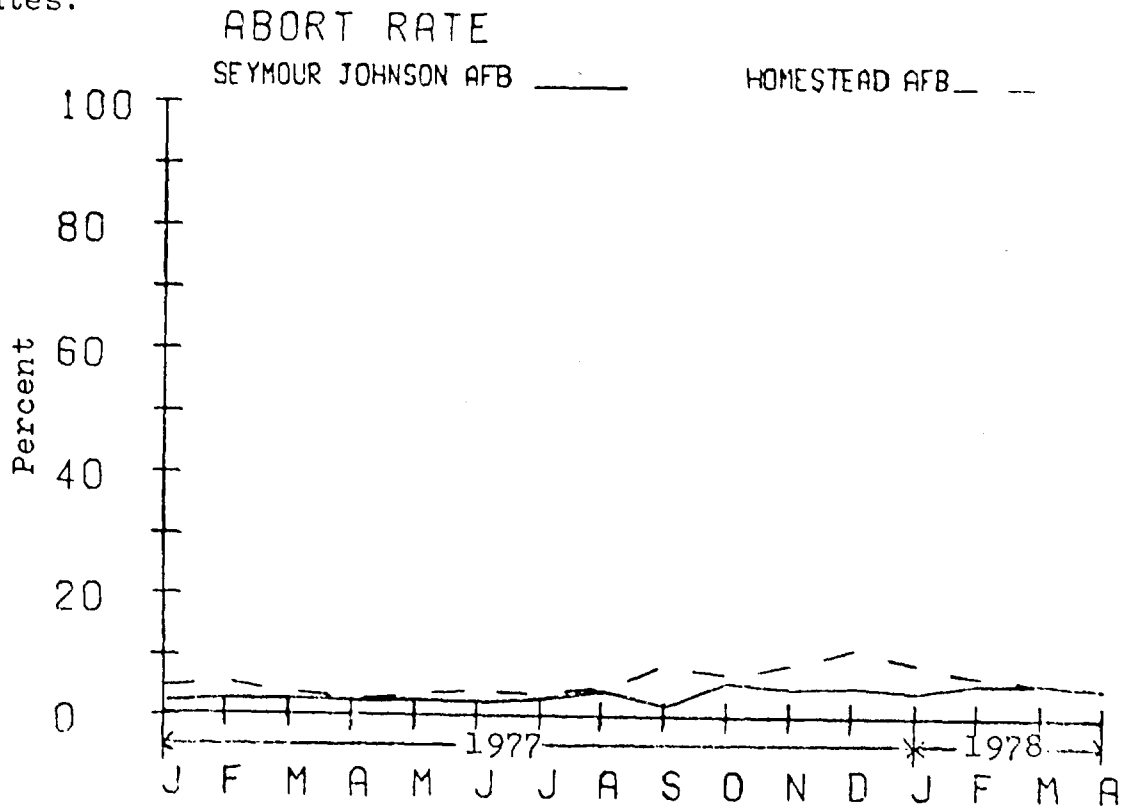


Figure 12. Graph of Data Values for Abort Rate (Variable 5)

Variable 8: Direct Labor Manhour Rate. The graph presented in Figure 13 and ANOVA analysis results presented in Table 6 indicate that a significant increase in the direct labor manhour rate occurred after implementation of POMO. Figure 13, however, also shows that this increase is consistent with a constant rise in this rate which has occurred for the entire 16-month period that data was available. Since the graph failed to show a significant change in the rate that could be associated to POMO implementation, POMO has probably had little, if any, effect on this rate.

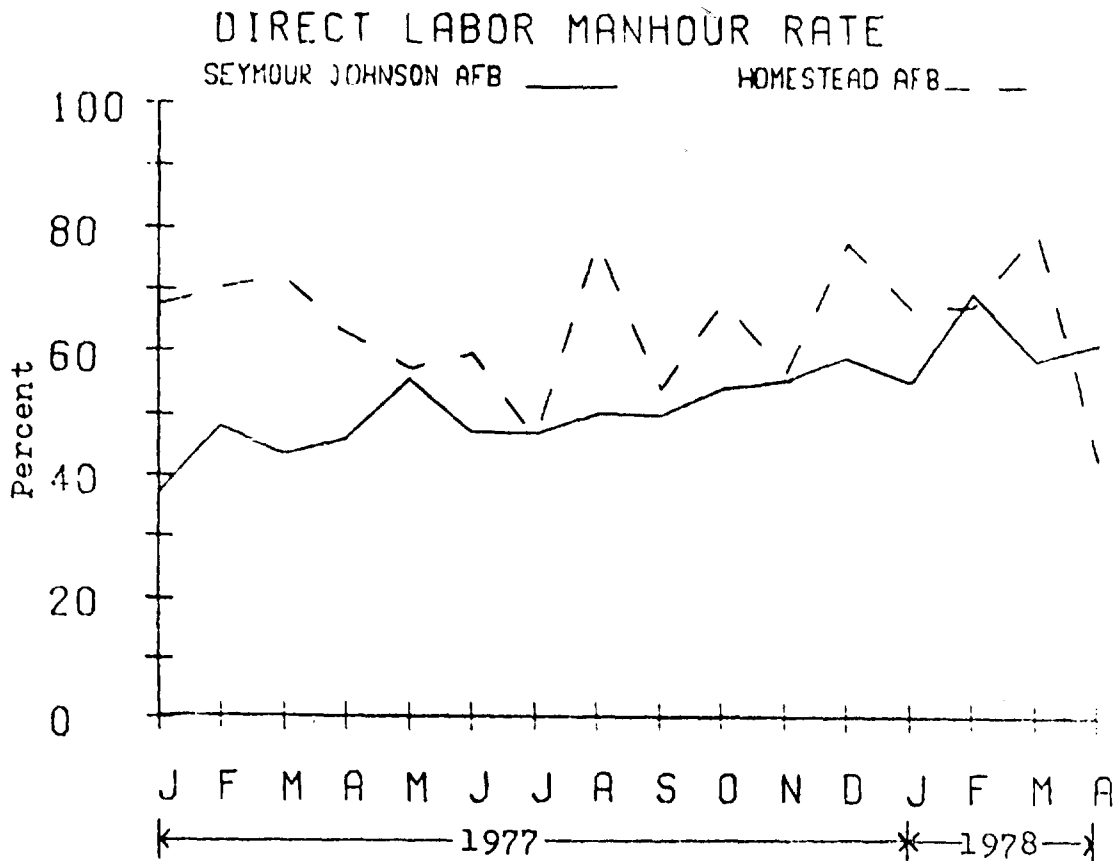


Figure 13. Graph of Data Values for Direct Labor Man-hour Rate (Variable 8)

Evaluation of Personnel and  
Equipment Pass Rates

Sufficient data was not available from either the test or comparison base to allow statistical evaluation of the two remaining variables relating to maintenance performance and maintenance personnel behavior. These two were Variable 7 (Quality Control Equipment Evaluation Pass Rate) and Variable 14 (Quality Control Personnel Evaluation Pass Rate). Prior to September 1977, numerical ratings given by quality control inspectors during equipment and personnel evaluations precluded an accurate determination of "pass" or "fail". Therefore, a pass rate could not be calculated to allow statistical evaluation during this research.

The graphs of the available data are presented in Figures 14 and 15. This data shows several interesting points. First, Homestead had consistently higher pass rates for both variables than Seymour Johnson. The higher pass rates could have been caused either by assignment of inspectors at Seymour Johnson who were more critical during their evaluations or by a higher quality of work performed by more capable maintenance personnel at Homestead. Second, the data obtained from Seymour Johnson for these two variables appears to be related. As the personnel evaluation pass rate increases, so does the equipment evaluation pass rate. Likewise, as the personnel evaluation rates fall, so do the equipment rates. This apparent relationship tends to

indicate that maintenance personnel are performing their assigned duties in a manner which is commensurate with their abilities. Therefore, their behavior appears to be consistent with their productivity.

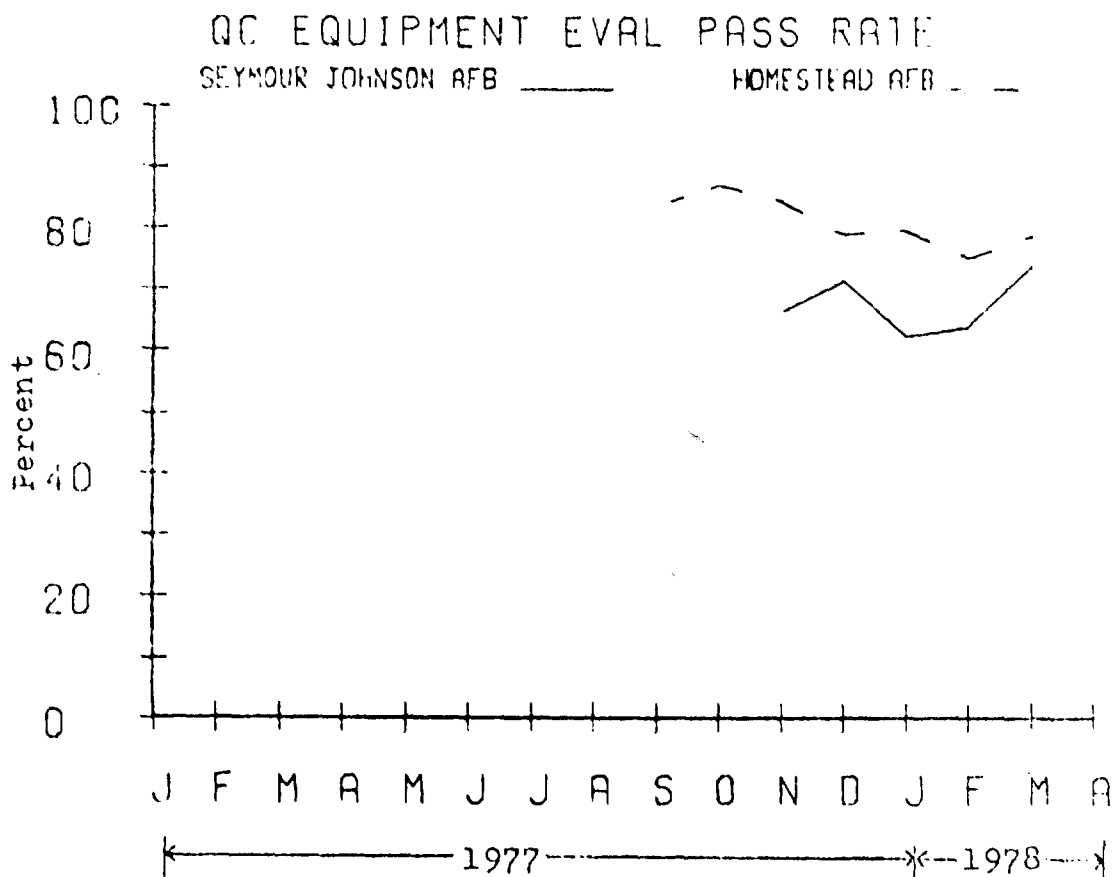


Figure 14. Graph of Data Values for Quality Control Equipment Evaluation Pass Rate (Variable 7)

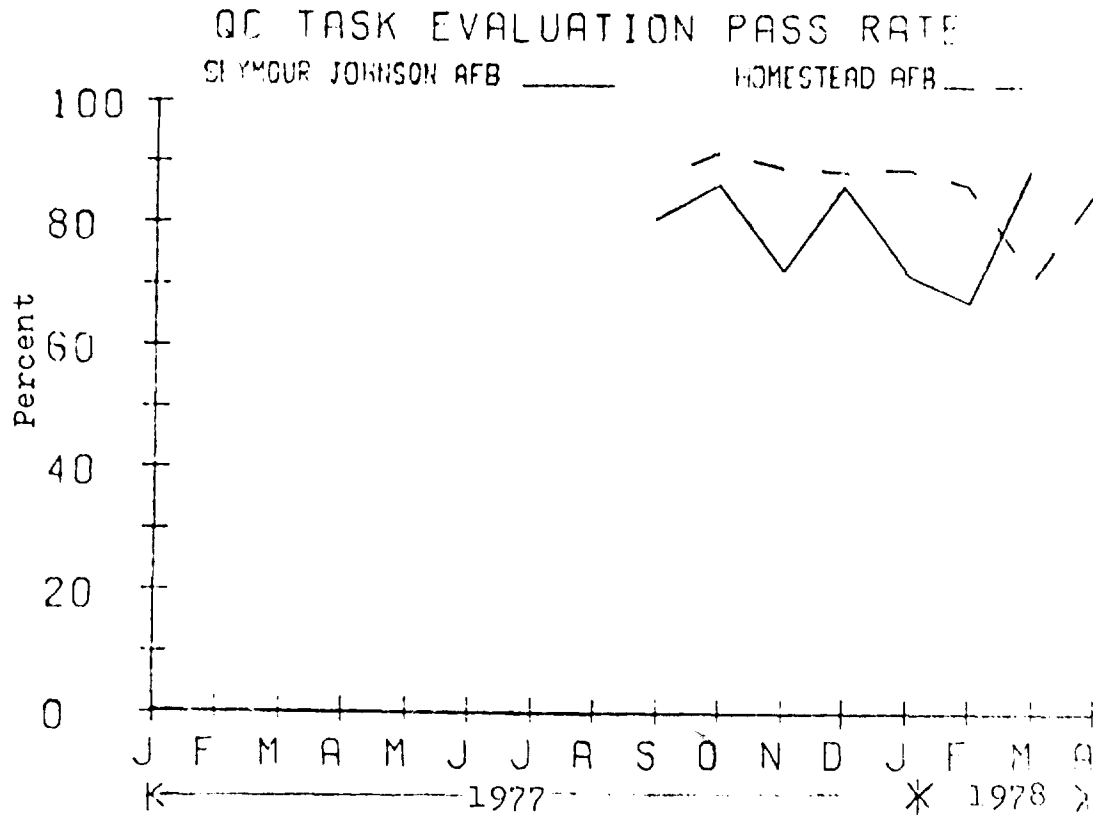


Figure 15. Graph of Data Values for Quality Control Task Evaluation Pass Rate (Variable 14)

Variables Relating to Personnel Attitudes

The research variables relating to personnel attitudes, variables 15-18, are subdivided into the following 12 factors:

Variable 15: Group Climate

- \*Factor F1: Rewards
- \*Factor F2: Communications and Rapport
- \*Factor F3: Structure

Variable 16: Work Group Productivity

- \*Factor F5: Commitment and Competition
- \*Factor F6: Skills

- \*Factor F7: Norms
- \*Factor F8: Intragroup Cooperation
- \*Factor F9: Intergroup Cooperation
- \*Factor F12: Organizational Commitment

Variable 18: Job Satisfaction

- \*Factor F10: General Satisfaction
- \*Factor F11: Specific Satisfaction

Application of Analysis of  
Covariance to Personnel  
Attitude Indicators

The analysis of covariance of personnel attitude factors used a stepwise inclusion process of multiple linear regression (MLR). The post-POMO survey factor score was regressed against several independent variables in the following sequence:

- Step 1: The three sample groups
- Step 2: The pre-POMO survey factor score
- Step 3: The interactive terms

Interpreting the results of this analysis of covariance, the extent of interaction between groups (e.g. Seymour Johnson, Homestead, and Hill) needs to be determined. This was accomplished by looking at the amount of variance in the data which was explained by the interactive terms of the model.  $R^2$  is the amount of variance explained by the regression equation at each step. To determine the amount of variance explained by the interactive terms, the  $R^2$  in

Step 3 of the regression was subtracted from the  $R^2$  in Step 2. This gave a value for the change in  $R^2$  ( $\Delta R^2$ ) due to the interactive terms. This value multiplied by the associated degrees of freedom produced the F-statistic which was used as a measure of the level of significance of the interactive terms of the model. Table 8 summarizes the results of this analysis for the 12 factors being evaluated to determine the impact of POMO on maintenance personnel attitudes.

The results displayed in Table 8 indicate that the interactive terms are significant for only two of the factors being evaluated -- F1 (Rewards) and F4 (Productivity). As a result, analysis of covariance is inappropriate for evaluating these two factors but was appropriate for the remaining 10.

For the factors F1 and F4, ANOVA was applied to the post-POMO data presented in Table 9.

The results of this analysis show that only Factor F1 (Rewards) is statistically significant. The means ( $\bar{X}$ ) for this factor's data from the test and comparison groups show that Homestead ( $\bar{X} = 3.77$ ) is considerably different from both Hill ( $\bar{X} = 3.34$ ) and Seymour Johnson ( $\bar{X} = 3.33$ ). Therefore, the significant F-statistic for Factor F1 resulted from differences in the data means between the comparison groups (Homestead and Hill) rather than as a result of implementation of POMO at Seymour Johnson.



TABLE 8

## SUMMARY OF CHANGES IN EXPLAINED VARIANCE DUE TO INTERACTIVE TERMS USING ANALYSIS OF COVARIANCE (ACOVA)

Factor	Interactive		$\Delta R^2$	F-statistic	Degrees of Freedom	Level of Significance
	Terms $R^2$	Pre-test Score $R^2$				
Rewards	.32359	.31141	.01218	4.54	374	.034
Communications and Rapport	.23430	.23264	.00166	.61	374	NS*
Structure	.23115	.22805	.00310	1.15	374	NS
Productivity	.19196	.17942	.01254	4.69	374	.031
Commitment and Competition	.07834	.07552	.00282	1.05	374	NS
Skills	.18922	.18587	.00335	1.25	374	NS
Norms	.11471	.11278	.00193	.72	374	NS
Intragroup Cooperation	.15738	.15290	.00448	1.68	374	NS
Intergroup Cooperation	.12913	.12686	.00227	.85	374	NS
Organizational Commitment	.30959	.30538	.00421	1.57	374	NS
General Satisfaction	.18668	.18643	.00025	.09	374	NS
Specific Satisfaction	.19017	.18551	.00466	1.74	374	NS

\* Not Significant

TABLE 9

ONEWAY ANOVA FOR GROUP CLIMATE-REWARDS AND  
WORK GROUP PRODUCTIVITY-PRODUCTIVITY

Group Climate-Rewards					
Source	df*	Sum of Squares	Mean of Squares	F-Ratio	F-Prob
Between groups	2	15.84	7.92	4.652	0.010
Within groups	377	641.73	1.70		
TOTAL	379	657.56			
Work Group Productivity-Productivity					
Between groups	2	0.01	0.005	0.010	0.978
Within groups	377	172.15	0.457		
TOTAL	379	172.16			

\* df - degrees of freedom

As indicated earlier, the assumption of independence between the test and comparison groups was determined to be valid for the remaining 10 factors. In order to determine the existence of a significant amount of variance explained by the introduction of the test and comparison groups into the covariance model, the following stepwise inclusion process was used:

Step 1: The pre-POMO survey factor score

Step 2: The three sample groups

The results of the analysis performed on the 10 factors are presented in Table 10. Of these 10 factors, 9 show no statistically significant amounts of variance which can be

TABLE 10

## SUMMARY OF CHANGES IN EXPLAINED VARIANCE FOR SAMPLE GROUPS

Factor	Sample Group R <sup>2</sup>	Pre-test Score R <sup>2</sup>	$\Delta R^2$	F-statistic	Degrees of Freedom	Levels of Significance
Communications and Rapport	.23264	.22976	.0029	1.08	376	NS*
Structure	.22805	.20808	.0200	7.51	376	.006
Commitment and Competition	.07552	.07442	.0011	.41	376	NS
Skills	.18587	.17905	.0068	2.56	376	NS
Norms	.11278	.11011	.0027	1.00	376	NS
Intragroup Cooperation	.15290	.14778	.0051	1.93	376	NS
Intergroup Cooperation	.12686	.12520	.0017	.62	376	NS
Organizational Commitment	.30538	.30507	.0003	.12	376	NS
General Satisfaction	.18643	.18051	.0059	2.20	376	NS
Specific Satisfaction	.18551	.17928	.0062	2.34	376	NS

\* Not Significant

explained by the test group (Seymour Johnson) or the comparison groups (Homestead and Hill) upon their introduction into the covariance model. Therefore, for these 9 factors, there was no significant change in the attitudes of maintenance personnel at either the test or comparison bases upon implementation of POMO at Seymour Johnson.

Factor F3 (Structure) was the only one which shows a significant amount of variance which can be explained by introducing the sample groups into the model. The results of the statistical analysis for Factor F3 are summarized in Table 11. Analysis results show that the F-statistics for both Seymour Johnson and Homestead for this factor are significant. An evaluation of the means ( $\bar{X}$ ) for this factor's pre-POMO data at all three of the test/comparison bases show that the mean at Hill ( $\bar{X} = 2.35$ ) is significantly different to that obtained for either Seymour Johnson ( $\bar{X} = 2.83$ ) or Homestead ( $\bar{X} = 2.91$ ). Therefore, the significant F-statistics for Factor F3 resulted from differences in the means between the comparison groups (Homestead and Hill) rather than as a result of implementation of POMO at Seymour Johnson.

TABLE 11

ANALYSIS OF COVARIANCE RESULTS FOR FACTOR F3  
(STRUCTURE)

Group Climate-Structure				
	df	Sum of Squares	Mean Square	F
Regression	3	116.33	38.78	37.99
Residual	378	385.85	1.02	

Multiple R = 0.48130  
 $R^2 = 0.23165$

Adjusted  $R^2 = 0.22556$   
 Standard Error = 1.01032

## Variables in the Equation

Variable	B	Beta	Standard Error B	F
D1 (Homestead)	0.45616	0.18111	0.15297	8.892
D2 (Seymour Johnson)	0.37924	0.16527	0.13939	7.402
F3 (pre-POMO Score)	0.48581	0.44935	0.04889	98.759
(Constant)	1.18945			

Summary

The purpose of this chapter was to analyze the data obtained during this research effort and to present the results of the analyses which were performed. A strategy decision tree for data analysis was used to determine which statistical techniques, if any, were to be applied to data for each of the research variables. The results of the analyses performed during this research are summarized in Table 12.

TABLE 12

## SUMMARY OF ALL ANALYSIS RESULTS

## Variables Relating to Maintenance Performance:

Variable Name/ Number	Statistical Test Applied	Significant Difference Within the Test Group*		Significant Difference Between Test/ Comp Groups**	
		yes	no	yes	no
Flyable Air- craft Rate (1)	ANOVA	X		X	
NMCM Rate (2)	ANOVA		X		NA
NMCS Rate (3)	ANOVA	X		X	
Scheduling Effectiveness Rate (4)	ANOVA	X		X	
Abort Rate (5)	ANOVA	X		X	
Cannibaliza- tion Rate (6)	ANOVA		X		NA
Equipment Evaluation Pass Rate (7)	+		NA		NA
Direct Labor Manhour Rate (8)	ANOVA	X		X	

## Variables Relating to Maintenance Personnel Behavior:

First Term Reenlistment Rate (9)	Chi square		NA	X	
Second Term Retention Rate (10)	Chi square		NA		X

Continued

TABLE 12 (Continued)

Variables Relating to Maintenance Personnel Behavior:

Variable Name/ Number	Statistical Test Applied	Significant Difference Within the Test Group*		Significant Difference Between Test/ Comp Groups**	
		yes	no	yes	no
Career Retention Rate (11)	Chi square				X
Retirement Rate (12)	ANOVA		X	NA	
Administrative Discharge Rate (13)	ANOVA		X	NA	
Task Evaluation Pass Rate (14)	+		NA	NA	

Variables Relating to Maintenance Personnel Attitude:

Group Climate (15)					
-Rewards	ANOVA, FA		NA	X	
-Communications and Rapport	ACOVA, FA		NA		X
-Structure	ACOVA, FA		NA	X	
Work Group Productivity (16)					
-Productivity	ANOVA, FA		NA		X
Work Group Relations (17)					
-Commitment and Competition	ACOVA, FA		NA		X
-Skills	ACOVA, FA		NA		X

Continued

TABLE 12 (Continued)

Variables Relating to Maintenance Personnel Attitude:

Variable Name/ Number	Statistical Test Applied	Significant Difference Within the Test Group*		Significant Difference Between Test/ Comp Groups**	
		yes	no	yes	no
-Norms	ACOVA, FA		NA		X
-Intragroup Cooperation	ACOVA, FA		NA		X
-Intergroup Cooperation	ACOVA, FA		NA		X
-Organizational Commitment	ACOVA, FA		NA		X
Job Satisfaction (18)					
-General Satisfaction	ACOVA, FA		NA		X
-Specific Satisfaction	ACOVA, FA		NA		X

\* Difference between pre-POMO and post-POMO data at Seymour Johnson.

\*\* Differences between the test group (Seymour Johnson) and the comparison group (Homestead) either pre-POMO or post-POMO (or both).

+ No statistical technique appropriate due to insufficient data.

NA-Not applicable



## Chapter 5

### CONCLUSIONS AND IMPLICATIONS

This chapter presents the conclusions and discussion of the implications of the research for the management of an aircraft maintenance organization. Each of the research hypotheses is evaluated to determine the presence or absence of expected outcomes.

#### Results of Research Objectives

The original objective for this research was to evaluate the effects of POMO on aircraft maintenance performance and the behaviors/attitudes of maintenance personnel. The design and execution of this research effort were directed toward this objective.

The POMO concept was conceived and implemented for the primary purpose of realizing greater efficiency and effectiveness of maintenance resources within the Air Force. These benefits were to be derived through various changes in maintenance philosophies, structure, operation, management, and control which existed with the specialized maintenance concept of AFM 66-1. Under POMO, individual effort was to be redirected to the efforts of the group; total system support was to be emphasized rather than the support of individual aircraft systems; supervisors and workers were

to possess greater autonomy on the job; greater decision making authority was to be delegated to flightline and shop personnel; worker identification with the mission of the maintenance organization was to be enhanced; and greater utility and flexibility of maintenance personnel were to be realized through realignment of duty responsibilities and training requirements. All of these characteristics of POMO were directed toward achievement of the basic goals of improved maintenance performance and improved maintenance personnel behaviors/attitudes. The analysis of the indicators (i.e. variables) selected for this research to evaluate these issues provide significant insight into the impact of POMO on the maintenance organization and its assigned personnel.

#### POMO and Aircraft Maintenance Performance

Eight hypotheses were proposed in this research to support the performance improvement objectives anticipated under the POMO organization. The performance indicators used to test these hypotheses were expected to either increase or decrease dependent upon the nature of the specific variable. Each of these hypotheses is restated below with conclusions drawn based upon the results of this research.

Hypothesis 1: The percentage of operational aircraft will increase under the POMO maintenance concept.

Conclusion: This hypothesis was not supported by the results of this research. In fact, Seymour Johnson experienced a significant decrease in their flyable aircraft rate after implementing POMO. While some of this decrease might possibly be explained by the changes in the aircraft status reporting system, as mentioned in Chapter 4, at least a portion of this decrease could be attributed to POMO since Homestead did not show a similar significant decrease in their flyable aircraft rate. POMO seems to have resulted in a degraded flyable aircraft rate rather than the improvement hypothesized.

Hypothesis 2: The percentage of aircraft which are not flyable due to maintenance will decrease under the POMO maintenance concept.

Conclusion: This hypothesis was not supported by the research results. These results indicate that Seymour Johnson experienced no change in their NMCM rate after implementing POMO.

Hypothesis 3: The percentage of aircraft which are not flyable due to the non-availability of repair parts (NMCS) will decrease under the POMO concept.

Conclusion: This hypothesis was not supported by the research results. In fact, the NMCS rate increased.

The increase might have been primarily related to the change in the aircraft status reporting system, however, there is some evidence that POMO may have contributed to the increase.

Hypothesis 4: The percentage of aircraft which are flown as scheduled will increase under the POMO maintenance concept.

Conclusion: This hypothesis was not supported by the research results. In fact, the percentage of scheduled aircraft flown as scheduled decreased significantly which seems to be attributable to POMO.

Hypothesis 5: The percentage of aircraft aborts will decrease under the POMO maintenance concept.

Conclusion: This hypothesis was not supported by the research results. This research shows a significant increase in the abort rate at Seymour Johnson after implementing POMO. However, Homestead shows a similar increase of even greater magnitude. Therefore, some other factor or factors appear to be influencing the rate. An examination of data shows that the rate starts to increase during the months of September and October 1977 and continues upward until the middle of the winter (January) before decreasing. It appears that the rise in the abort rate may be attributable more to winter weather than to other factors.

Hypothesis 6: The number of aircraft maintenance actions which require cannibalization of repair parts from another aircraft will decrease under the POMO maintenance concept.

Conclusion: This hypothesis was not supported by the research results. Since the rate of cannibalization is more a factor of repair parts availability than maintenance capability, these results are not totally unexpected.

Hypothesis 7: The percentage of satisfactory equipment evaluations performed by Quality Control will increase under the POMO concept.

Conclusion: This hypothesis could not be tested due to the non-availability of data for the period prior to POMO implementation.

Hypothesis 8: The percentage of available maintenance technician manhours consumed in direct labor will decrease under the POMO maintenance concept.

Conclusion: This hypothesis was not supported by the research results. The results showed a significant increase in the direct labor manhour rate at Seymour Johnson, however, this increase was steady over the entire period of data. This increase was probably caused by management pressure applied to maintenance personnel to improve the

documentation of direct labor manhours through the Maintenance Data Collection System rather than caused by the implementation of POMO.

#### The Impact of POMO on Aircraft Maintenance Performance

Whereas maintenance performance was expected to improve with the implementation of POMO, this research failed to support this assertion. Of the eight performance-related variables, none showed improvement after POMO implementation while five actually showed a degradation of performance. Therefore, it is apparent, for these research results, that POMO has not yet resulted in improved performance in the aircraft maintenance environment.

It should be noted, however, that this research evaluated POMO only under peacetime conditions. The POMO-type of organization may have potentially significant advantages for maintaining aircraft under wartime conditions. This aspect of POMO needs to be evaluated to give a clearer picture of the total capabilities of the POMO organization.

#### POMO and Behaviors of Maintenance Personnel

Six hypotheses were proposed in this research to support the behavior improvement objectives anticipated under the POMO organization. The behavioral indicators used to evaluate these hypotheses were expected to either increase or decrease depending upon the variable being

evaluated. These hypotheses are restated below with conclusions drawn based upon the results of this research.

Hypothesis 9: The percentage of first term maintenance personnel who reenlist will increase under the POMO concept.

Conclusion: This hypothesis was not supported by the research results. In fact, Seymour Johnson experienced a decrease in the first term reenlistment rate after implementation of POMO when compared to Homestead. POMO probably was the significant factor influencing this decrease.

Hypothesis 10: The percentage of second term maintenance personnel who reenlist will increase under the POMO maintenance concept.

Conclusion: This hypothesis was not supported by the research results. Apparently POMO was neither a positive nor negative factor in influencing the retention of second term maintenance personnel.

Hypothesis 11: The percentage of career maintenance personnel who reenlist will increase under the POMO maintenance concept.

Conclusion: This hypothesis was not supported by the research results. A career retention rate of essentially 100 percent was maintained after the implementation of POMO.

Hypothesis 12: The percentage of career maintenance personnel who retire will decrease under the POMO maintenance concept.

Conclusion: This hypothesis was not supported by the research results. The rate of maintenance personnel retiring from the Air Force was not affected by the implementation of POMO at Seymour Johnson.

Hypothesis 13: The percentage of maintenance personnel who receive administrative discharges will decrease under the POMO maintenance concept.

Conclusion: This hypothesis was not supported by the research results. Apparently POMO did not influence whether or not a maintenance person received an administrative discharge.

Hypothesis 14: The percentage of satisfactory personnel evaluations performed by Quality Control will increase under the POMO maintenance concept.

Conclusion: This hypothesis was neither supported nor unsupported by the research results due to the non-availability of data from the period before POMO implementation. The personnel evaluation pass rate appears to be directly related to the equipment evaluation pass rate. This relationship could be indicative of the fact that maintenance personnel are performing their duties in a manner which seems consistent with their abilities.



The Impact of PCMO on the  
Behavior of Maintenance  
Personnel

POMO was expected to have a positive effect upon the behaviors of maintenance personnel. However, of the six indicators selected to evaluate this expectation, none of these indicators showed an improvement in the behavior patterns of maintenance personnel as a result of POMO, while one of the indicators, first term reenlistment rate, showed a decrease. Therefore, POMO has not produced any positive effects on the behaviors of maintenance personnel as measured by these indicators. On the contrary, there is a strong possibility that POMO has had a detrimental effect on at least the first term reenlistment rate of maintenance personnel.

POMO and Attitudes of  
Maintenance Personnel

Four hypotheses were proposed in this research to support the attitudinal improvement objectives anticipated under the POMO organization. Twelve factors were developed to evaluate these hypotheses and were expected to reflect the changes in attitudes of maintenance personnel resulting from the implementation of POMO. These hypotheses are restated below with conclusions drawn based upon the results of this research.

Hypothesis 15: The group climate among aircraft maintenance personnel will be perceived as being improved under the POMO maintenance concept.

Conclusion: This hypothesis was not supported by the research results. Of the three factors developed to evaluate this hypothesis, none showed a significant change, either positively or negatively, between Seymour Johnson and the two comparison bases as a result of POMO.

Hypothesis 16: Perceived work group productivity will be higher under the POMO maintenance concept.

Conclusion: This hypothesis was not supported by the research results. The single factor developed to evaluate this hypothesis showed no significant change, either positively or negatively, between Seymour Johnson and the two comparison bases as a result of POMO.

Hypothesis 17: Perceived work group relations among aircraft maintenance personnel will be improved under the POMO maintenance concept.

Conclusion: This hypothesis was not supported by the research results. The six factors developed to evaluate this hypothesis again showed no change between Seymour Johnson and the comparison groups as a result of POMO.

Hypothesis 18: Maintenance personnel will experience higher levels of job satisfaction under the POMO maintenance concept.

Conclusion: This hypothesis was not supported by the research results. The two factors developed to evaluate this hypothesis showed, as before, no change between Seymour Johnson and the comparison groups as a result of POMO.

The Impact of POMO on the Attitudes of Maintenance Personnel

Again, the results of this research fail to support the contention that personnel attitudes have been improved under POMO. Of the 12 factors developed to evaluate the four hypotheses on attitudinal behavior, none showed a significant difference between Seymour Johnson and the two comparison bases that could be attributed to POMO. It can be noted, however, that there apparently was no degradation directly attributable to POMO as well.

Overall Conclusions

Based upon this research, POMO has had little if any, positive effect on aircraft maintenance in a peacetime operating environment. On the contrary, there are strong indications that POMO has caused some degradation in aircraft maintenance performance and upon the first term reenlistment rate of maintenance personnel. Due to the relatively short period of time encompassed by this research

after implementation of POMO at Seymour Johnson (6 months), these negative effects may only be temporary and could improve with time.

It may be that POMO is not a more efficient and effective maintenance organization than the specialized maintenance concept under peacetime operations. Because POMO is organized to achieve a high rate of sortie generation during wartime conditions, the overall success of this maintenance concept in meeting Air Force wartime requirements, cannot be fully assessed until it is tested under practice Emergency War Order/Contingency conditions.

#### Implications for Management

Based upon this research and the conclusions drawn, POMO appears to have little positive effect on aircraft maintenance. Therefore, the question can be logically asked, "Did POMO really change aircraft maintenance as much as was expected?" This question can be answered in at least two ways. The first answer might be that the organizational changes predicted by the theoretical construct of the POMO organization never really occurred, or at least never occurred to any significant degree during the period of this research. For example, do the Aircraft Maintenance Units really have more freedom and control over the maintenance on their aircraft? The field trips made to collect the data for this research indicated that Job Control still controlled a significant number of the maintenance actions.

In addition, a significant portion of the on-aircraft maintenance was still performed by specialist dispatch from the CRS and EMS. If, therefore, the maintenance personnel have only changed squadrons, but are still doing their work in the same manner as before, then POMO has not really changed the process of maintaining aircraft. If this is the correct answer to the question, then there is hope that as the change process continues and management begins to allow the POMO organization to perform as designed, then some or all of the predicted improvements under POMO might come to be.

There is, however, at least one other answer to this question. A strong possibility exists that the predicted improvements under POMO may never be realized because POMO affected only a small portion of the maintenance process. The process of maintaining aircraft on a day to day basis can be thought of as a function of manpower and spare parts. The efficiency with which maintenance technicians repair aircraft is a function of the sequence of tasks required to perform a maintenance action, the skill of the technician, the rapidity with which spare parts are received, and the ability of the organization to rapidly respond to maintenance requirements. If the Air Force wants increased productivity, then one or all of the components of maintenance efficiency must be improved. Organizational efficiency has in many cases only a limited impact on the overall efficiency of a maintenance action when compared to the time

embodied in the sequence of tasks required in the maintenance action itself. POMO has sought to improve organizational efficiency and enlarge some job requirements, but appears to have had little impact on the overall skill of the maintenance personnel and no impact on the efficiency of the task sequence within a particular maintenance action. Therefore, it might be expected that POMO would meet with only limited success.

However, the real answer to whether or not POMO has really changed the maintenance process is probably a combination of factors. Management may not have permitted maintenance personnel the freedom to change POMO to its optimum efficiency. Also, POMO may not have changed the important determinants of efficiency in the maintenance process. The implications for managers are twofold. First, management should allow maintenance personnel enough freedom to prove POMO, as designed, either better or worse than the old specialized maintenance concept. Second, management should continue to look at all of the factors that determine the efficiency with which maintenance is performed to seek improvement in other ways than those affected by POMO. Through these efforts, new initiatives may be gained in improving overall maintenance productivity in the Air Force.

### Future Research

While the present research represented an attempt to assess the overall impact of POMO upon the aircraft maintenance complex, significant areas of further study remain to be investigated. In the interest of expanding the body of knowledge into the effects of POMO, the following research subjects are presented.

#### Individual Effects of POMO

This present research effort looked at the effects of POMO on the entire maintenance complex. However, significant changes were made to the organization that could potentially affect the individual maintenance technician in varying degrees. Therefore, a considerable amount of research remains to be done to identify the effects of POMO on the individual maintenance technician.

#### The Cost of POMO

A second significant area of future research is to make a determination of the cost of POMO to the Air Force in terms of dollars and resources. One of the fundamental points for selling POMO was that the concept would allow the Air Force to do more maintenance with less resources. Because the Air Force is presently acting upon this premise by effecting manpower reductions, some assessment of the validity of this premise is required.

Cross Utilization Training  
(CUT) Program

A third area for future research is to assess the impact and effectiveness of the new training requirements under POMO using the CUT program. One of the significant changes to be made under POMO was to improve skill variety and task capability by training specialists to do more types of jobs. The training effort to accomplish this goal represents a significant expenditure of maintenance manhours both initially as well as continuously. Therefore, the expenditure of these manhours needs to be assessed in light of the overall maintenance effort and value to improving maintenance productivity.

Mobility and Emergency War  
Order (EWO) Reaction  
Under POMO

A fourth area for future research is to assess the ability of the POMO organization to meet mobility and EWO requirements. The maintenance complex is organized to produce effective wartime sorties. POMO has been proposed as the best organization to accomplish this goal. Therefore, POMO must be evaluated in a wartime condition to determine its capability to achieve this goal.

Modeling

A fifth area for future research is the need to model resource requirements for a POMO type of maintenance



organization. Presently several models are being used to determine manpower requirements, for example, the Logistics Composite Model (L-COM), however, these models are based on the specialist concept of aircraft maintenance. A potentially more insightful model could also be developed from a systems dynamics approach. In either case, system models could provide significant insight into the structure and resource requirements of the maintenance process to aid the decision maker in making more informed decisions.

APPENDIX A  
SUMMARY OF RESEARCH DATA

Seymour Johnson AFB												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1977	42.0	35.00	50.00	46.00	34.00	47.00	48.00	48.00	47.00	51.00	49.00	51.00
Percent	72.0	71.1	74.8	78.3	69.7	70.1	72.9	69.4	69.4	60.1	62.8	64.0
1978	52.0	36.00	54.00	48.00	51.00	48.00	48.00	48.00	48.00	48.00	48.00	48.00
Percent	69.9	62.0	68.0	63.0								

Homestead AFB												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1977	* * *	* * *	* * *	* * *	* * *	* * *	* * *	* * *	* * *	* * *	* * *	* * *
Percent	59.2	54.5	57.8	72.0	70.6	71.4	67.9	62.1	61.9	68.1	58.1	68.4
1978	* * *	* * *	* * *	* * *	* * *	* * *	* * *	* * *	* * *	* * *	* * *	* * *
Percent	63.0	58.5	66.0	69.9								

\* Specific data values not available

Data for Variable No. 1: FLYABLE AIRCRAFT RATE

Seymour Johnson AFB		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1977 (%)		25.4	26.5	24.2	21.0	28.3	27.6	25.6	28.5	27.5	31.9	28.7	29.6
1978 (%)		22.9	26.8	23.6	25.1								

Homestead AFB		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1977 (%)		33.7	38.2	35.6	23.1	23.4	25.0	24.9	30.8	33.4	24.1	30.8	25.6
1978 (%)		25.7	28.2	25.1	22.0								

\* Specific data values not available

Data for Variable No. 2: NOT MISSION CAPABLE FOR MAINTENANCE (NMCM) RATE

Seymour Johnson AFB		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1977 (%)	2.6	2.4	1.0	.7	2.0	2.3	1.5	2.1	3.1	2.0	8.4	6.3	
1978 (%)	7.2	11.2	8.5	11.9									

Homestead AFB		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1977 (%)	7.1	7.3	6.6	4.9	6.0	3.6	7.3	7.2	4.7	7.8	11.1	6.0	
1978 (%)	11.3	13.3	8.9	8.1									

\* Specific data values not available

Data for Variable No. 3: NOT MISSION CAPABLE FOR SUPPLY (NMCS) RATE

Seymour Johnson AFB		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1977 (%)	83.6	86.7	87.4	85.4	82.3	84.6	78.2	81.9	86.8	77.2	79.2	83.2	
1978 (%)	82.6	73.9	76.0	74.2									

Homestead AFB		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1977 (%)	73.4	65.6	77.4	85.9	71.7	77.4	79.7	71.3	66.5	73.4	70.2	62.9	
1978 (%)	72.5	74.0	79.1	84.7									

\* Specific data values not available

Data for Variable No. 4: SCHEDULING EFFECTIVENESS RATE

Seymour Johnson AFB		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1977		'72 23	'78 28	'84 37	'90 50	'96 38	'02 20	'08 33	'14 27	'20 23	'26 46	'32 54	'38 42
Percent		2.32	2.94	2.94	2.46	2.87	2.53	3.32	4.56	2.06	5.70	4.74	5.25
1978		'77 50	'83 43	'89 48	'95 45								
Percent		4.05	5.75	5.71	4.77								

Homestead AFB		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1977		'76 44	'80 47	'84 47	'88 29	'92 45	'96 52	'00 39	'04 59	'08 29	'12 44	'16 23	'20 19
Percent		4.75	5.34	3.98	2.66	3.69	4.37	3.71	4.91	8.49	7.19	8.68	11.19
1978		'77 102	'83 62	'89 74	'95 54								
Percent		9.07	6.60	5.73	5.29								

\* Specific data values not available

Data for Variable No. 5: ABORT RATES

Seymour Johnson AFB		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1977		1.7	2.8	3.8	2.4	3.0	2.2	3.0	5.3	2.1	1.9	4.0	2.7
1978		2.4	2.9	2.4	4.0								

Homestead AFB		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1977		4.8	4.2	4.1	3.1	2.2	2.7	4.9	6.5	6.7	5.4	4.7	3.9
1978		6.1	6.8	3.3	4.5								

+ Data values represent average number of cannibalizations per aircraft.

Data for Variable No. 6: CANNIBALIZATION RATES



Seymour Johnson AFB																									
	Jan.		Feb.		Mar.		Apr.		May		Jun.		Jul.		Aug.		Sep.		Oct.		Nov.		Dec.		
1977	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Percent																									
1978	88	55	83	53	92	48	*	*																	
Percent	62.5	63.9	73.9																				66.7	71.6	

Homestead AFB																								
	Jan.		Feb.		Mar.		Apr.		May		Jun.		Jul.		Aug.		Sep.		Oct.		Nov.		Dec.	
1977	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Percent																								
1978	77	74	74	74	76	73	*	*									80	82	85	87	87	84	82	85
Percent	79.7	75.3	78.9														83.9	87.2	84.7	79.1				

\* Specific data values not available

Data for Variable No. 7: QUALITY CONTROL EQUIPMENT EVALUATION PASS RATE

Seymour Johnson AFB												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1977	20,000 20,93	21,211 20,967	20,645 21,134	21,207 20,790	21,800 21,466	21,033 21,411	23,888 22,028	20,267 20,492	20,362 19,100	21,251 21,86	21,141 21,141	21,116 21,116
Percent	36.9	47.8	43.4	46.1	55.7	47.4	46.9	50.1	50.0	54.4	55.5	59.1
1978	20,000 11,000	20,000 12,000	20,000 13,000	20,000 17,000	20,000 14,000	20,000 16,000	20,000 15,000	20,000 14,000	20,000 13,000	20,000 15,000	20,000 14,000	20,000 13,000
Percent	55.2	59.9	58.8	61.7								

Homestead AFB												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1977	20,000 24,10	20,000 23,10	20,000 24,10	20,000 23,10	20,000 24,10	20,000 23,10	20,000 24,10	20,000 23,10	20,000 24,10	20,000 23,10	20,000 24,10	20,000 23,10
Percent	67.4	70.5	72.2	63.1	57.3	59.7	46.4	78.0	54.0	68.3	57.1	77.8
1978	20,000 20,000	20,000 20,000	20,000 20,000	20,000 20,000	20,000 20,000	20,000 20,000	20,000 20,000	20,000 20,000	20,000 20,000	20,000 20,000	20,000 20,000	20,000 20,000
Percent	67.3	67.7	80.0	42.9								

\* Specific data values not available

Data for Variable No. 8: DIRECT LABOR MANHOJR RATE

Seymour Johnson AFB																								
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec												
1977	11	7	15	7	8	7	10	5	7	1	9	4	6	1	35	6	24	3	7	3	7	2	9	1
Percent	63.6	46.7	87.5	50.0	14.3	44.4	16.7	17.1	12.5	42.9	28.6	11.1												
1978	9	3	8	3	9	5	4	1																
Percent	33.3	37.5	55.6	25.0																				

Homestead AFB																								
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec												
1977	17	7	7	3	7	3	14	6	7	2	4	2	6	4	25	2	10	4	5	3	5	5	3	3
Percent	41.2	42.9	42.9	42.9	28.6	50.0	66.7	8.0	40.0	60.0	100	100												
1978	3	2	7	4	1	0	8	3																
Percent	66.7	57.1	0	37.5																				

\* Specific data values not available

Data for Variable No. 9: FIRST TERM REENLISTMENT RATE

Seymour Johnson AFB																		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec						
1977	4	3	1	0	3	1	3	2	4	3	4	1	1	4	4	3	5	4
Percent	75.0	0	33.3	66.7	75.0	25.0	50.0	100	100	100	100	75.0	100	100	75.0	80.0	80.0	
1978	2	1	1	1	5	5	2	1										
Percent	50.0	100	100	50.0														

Homestead AFB																			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec							
1977	7	7	2	2	0	5	4	4	3	2	3	1	2	2	2	4	2	3	3
Percent	100	100	0	80.0	75.0	66.7	33.3	100	100	100	66.7	50.0	50.0	66.7	100	50.0	66.7	100	
1978	1	1	4	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Percent	100	75.0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	

\* Specific data values not available

Data for Variable No. 10: SECOND TERM RETENTION RATE

Seymour Johnson AFB												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1977	8	0	2	3	6	2	3	7	6	5	9	8
Percent	100	-	100	100	100	100	100	85.7	100	100	100	100
1978	7	9	8	4								
Percent	100	100	100	100								

Homestead AFB												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1977	6	4	8	5	5	3	3	5	4	6	5	8
Percent	100	100	87.5	80.0	100	100	100	80.0	100	100	100	100
1978	4	3	4	3								
Percent	100	100	100	100								

\* Specific data values not available

Data for Variable No. 11: CAREER RETENTION RATE

10-10-78

Seymour Johnson AFB												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1977	* 20	5 17	2 12	0 12	4 21	7 18	5 26	8 17	6 16	4 16	6 1	10 2
Percent		25.0	11.8	0	33.3	33.3	27.8	30.8	35.3	25.0	16.7	20.0
1978	15 3	8 3	6 1	9 1								
Percent	20.0	37.5	16.7	11.1								

Homestead AFB												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1977	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	7 2
Percent												28.6
1978	11 6	14 5	10 5	7 1								
Percent	54.5	35.7	50.0	14.3								

\* Specific data values not available

Data for Variable No. 12: RETIREMENT RATE

Seymour Johnson AFB																							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec											
1977	11	7	23	6	27	3	25	9	14	8	29	19	18	7	16	5	13	5	16	12	18	7	
Percent	63.6	53.9	26.1	11.1	36.0	57.1	65.5	38.9	31.3	38.5	75.0	38.9											
1978	13	6	18	5	6	2	7	3															
Percent	46.2	27.8	33.3	42.9																			

Homestead AFB																									
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec													
1977	10	5	9	2	15	6	18	10	12	6	12	7	6	2	3	1	8	1	10	6	5	2	12	6	
Percent	50.0	22.2	40.0	55.6	50.0	58.3	33.3	33.3	12.5	60.0	40.0	50.0													
1978	7	3	7	3	11	5	10	3																	
Percent	42.9	42.9	45.5	30.0																					

\* Specific data values not available

Data for Variable No. 13: ADMINISTRATIVE DISCHARGE RATE

Seymour Johnson AFB																											
	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec				
	1977	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	'30	'06	'69	'47	'06	'77	'89	'77		
Percent																							81.5	87.0	72.6	86.5	
1978	97	70	'27	86	265	238	*	*																			
Percent																							72.2	67.7	89.8		

Homestead AFB																										
	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec			
	1977	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	327	282	242	223	213	280	325	289	
Percent																							87.9	92.1	89.5	88.9
1978	309	275	257	232	35	25	68	58																		
Percent																							89.0	86.4	71.4	85.3

\* Specific data values not available

Data for Variable No. 14: QUALITY CONTROL TASK EVALUATION PASS RATE



APPENDIX B  
JOB ATTITUDE SURVEY

## JOB ATTITUDE SURVEY

This questionnaire is designed to assist in the study of your job and show how it affects you. The survey data will be used to improve your job.

The questions are designed to measure your perceptions of your job and your reactions to it. Please answer each item as honestly and frankly as possible. Use a lead pencil to mark your answers on the scoring sheet. Please be sure to complete the top portion of the scoring sheet.

Thank you for your cooperation and participation.

Lt Col Denis D. Umstot, Ph.D.  
Asst. Professor of Management  
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U. S. Air Force Academy, CO 80840

USAF SCN 77-138  
(Expires 1 Aug 78)

## PRIVACY ACT STATEMENT

In accordance with AFR 30-23, 22 Sept 76, Air Force Privacy Act Program, the following information is provided as required by the Privacy Act of 1974.

a. This survey information is authorized for solicitation by Federal Statute Title 10, United States Code, Section 8012, Executive Order 9397, 22 Nov 43, DODI 1100.13, 17 Apr 68, and AFR 178-9, 9 Oct 73.

b. The principal purpose for which this survey will be used is to measure specific motivational aspects of your work in an effort to allow for positive change where possible.

c. Routine use in addition to the above will include utilization of this data in the conduct of Air Force research in the area of organizational change.

d. The analysis of this questionnaire will be done at the Air Force Academy. Individual questionnaires will not be available to anyone in your organization. Summaries of the data will be reported to managers of your organization for the purpose of improving your job.

e. Participation in this survey is voluntary.

f. No adverse action of any kind may be taken against any individual who elects not to participate in any or all of this survey.

GENERAL INSTRUCTIONS FOR COMPLETING  
THIS QUESTIONNAIRE

1. The questionnaire has twelve parts to complete. Each part has specific instructions. Your answers should be marked on the questionnaire booklet with a dark lead pencil.
2. When you complete the questionnaire you may return it to the survey project officer or if you prefer, place it in base mail for dispatch directly to the researchers.
3. Please complete the information on the top of the answer sheet before you start on the questionnaire. All information will be kept confidential. Only the researchers will have access to the individual responses.
4. Your social security number is needed for follow up purposes. Sometime in the future you may be asked to fill out a follow up questionnaire.
5. The work center code is very important for identifying how a group of people feel about their jobs. Please include the LAST FOUR DIGITS of the work center code in the space provided on the answer sheet.

SECTION ONE

This part of the questionnaire asks you to describe your job, as objectively as you can.

Please do not use this part of the questionnaire to show how much you like or dislike your job. Questions about that will come later. Instead, try to make your descriptions as accurate and as objective as you possibly can.

A sample question is given below.

A. To what extent does your job require you to work with mechanical equipment?

1-----2-----3-----4-----5-----6-----7  
Very little; the job requires almost no contact with mechanical equipment of any kind. Moderately Very much; the job requires almost constant work with mechanical equipment.

If, for example, your job requires you to work with mechanical equipment a good deal of the time--but also requires some paperwork--you might indicate the number six, as was done in the example below.

1 2 3 4 5 6 7

1. How much autonomy is there in your job? That is, to what extent does your job permit you to decide on your own how to go about doing the work?

1-----2-----3-----4-----5-----6-----7

Very little; the job gives me almost no personal "say" about how and when the work is done.	Moderate autonomy; many things are standardized and not under my control, but I can make some decisions about the work.	Very much; the job gives me the almost complete responsibility for deciding how and when the work is done.
---	---	--

2. To what extent does your job involve doing a "whole and identifiable" piece of work? That is, is the job a complete piece of work that has an obvious beginning and end? Or is it only a small part of the overall piece of work, which is finished by other people or by automatic machines?

1-----2-----3-----4-----5-----6-----7

My job is only a tiny part of the overall piece of work; the results of my activities cannot be seen in the final product or service.	My job is a moderate-sized "chunk" of the overall piece of work; my own contribution can be seen in the final outcome.	My job involves doing the whole piece of work, from start to finish; the results of my activities are easily seen in the final product or service.
---	--	--

3. How much variety is there in your job? That is, to what extent does the job require you to do many different things at work, using a variety of your skills and talents?

1-----2-----3-----4-----5-----6-----7

Very little; the job requires me to do the same routine things over and over again.	Moderate variety	Very much; the job requires me to do many different things, using a number of different skills and talents.
---	------------------	---

4. In general, how significant or important is your job? That is, are the results of your work likely to significantly affect the lives or well-being of other people?

1-----2-----3-----4-----5-----6-----7		
Not very significant; the outcomes of my work are <u>not</u> likely to have important effects on other people.	Moderately significant.	Highly significant; the outcomes of my work can affect other people in very important ways.

5. To what extent do managers or supervisors let you know how well you are doing on your job?

1-----2-----3-----4-----5-----6-----7		
Very little; supervisors almost never let me know how well I am doing.	Moderately; sometimes supervisors may give me "feedback;" other times they may not.	Very much; managers or supervisors provide me with almost constant "feedback" about how well I am doing.

6. To what extent does doing the job itself provide you with information about your work performance? That is, does the actual work itself provide clues about how well you are doing--aside from any "feedback" co-workers or supervisors may provide?

1-----2-----3-----4-----5-----6-----7		
Very little: the job itself is set up so I could work forever without finding out how well I am doing.	Moderately; sometimes doing the job provides "feedback" to me; sometimes it does not.	Very much; the job is set up so that I get almost constant "feedback" as I work about how well I am doing.

7. How clear and specific are the goals for your job? That is, do you know the specific goals you are expected to accomplish. (Goals or objectives are the end results that guide your job effort, such as repairing a certain number of components per day, attaining a certain OR rate for the day, completing an assigned project, etc).

1-----2-----3-----4-----5-----6-----7			
<table border="0"> <tr> <td style="vertical-align: top;">                 Not very clear;                  I do not know                  what the goals                  are.             </td> <td style="vertical-align: top; text-align: center;">                 Somewhat clear;                  although the                  goals are not                  specific, I                  think I know                  what the goals                  are.             </td> <td style="vertical-align: top;">                 Very clear;                  I know exactly                  what the goals                  are.             </td> </tr> </table>	Not very clear; I do not know what the goals are.	Somewhat clear; although the goals are not specific, I think I know what the goals are.	Very clear; I know exactly what the goals are.
Not very clear; I do not know what the goals are.	Somewhat clear; although the goals are not specific, I think I know what the goals are.	Very clear; I know exactly what the goals are.	

8. To what extent are your goals or work objectives difficult to accomplish?

1-----2-----3-----4-----5-----6-----7			
<table border="0"> <tr> <td style="vertical-align: top;">                 Very easy;                  I can accomplish                  the goals with                  minimum effort.             </td> <td style="vertical-align: top; text-align: center;">                 Moderately                  difficult to                  accomplish.             </td> <td style="vertical-align: top;">                 Very difficult;                  the goals are                  almost impossible                  to accomplish.             </td> </tr> </table>	Very easy; I can accomplish the goals with minimum effort.	Moderately difficult to accomplish.	Very difficult; the goals are almost impossible to accomplish.
Very easy; I can accomplish the goals with minimum effort.	Moderately difficult to accomplish.	Very difficult; the goals are almost impossible to accomplish.	

9. To what extent do you accept the work objectives or goals for your job?

1-----2-----3-----4-----5-----6-----7			
<table border="0"> <tr> <td style="vertical-align: top;">                 Very little;                  I ignore the                  goals and do                  as I please.             </td> <td style="vertical-align: top; text-align: center;">                 Moderately;                  I sometimes                  accept the                  goals.             </td> <td style="vertical-align: top;">                 Very much;                  I accept almost                  all goals.             </td> </tr> </table>	Very little; I ignore the goals and do as I please.	Moderately; I sometimes accept the goals.	Very much; I accept almost all goals.
Very little; I ignore the goals and do as I please.	Moderately; I sometimes accept the goals.	Very much; I accept almost all goals.	

10. To what extent do you have influence in the determination of your work objectives or goals?

1-----2-----3-----4-----5-----6-----7			
<table border="0"> <tr> <td style="vertical-align: top;">                 Very little;                  I have little                  say in deter-                  mining my goals.             </td> <td style="vertical-align: top; text-align: center;">                 Moderately;                  I have some in-                  fluence in deter-                  mining my goals.             </td> <td style="vertical-align: top;">                 Very much; I have                  a great deal of                  influence in deter-                  mining my goals.             </td> </tr> </table>	Very little; I have little say in deter- mining my goals.	Moderately; I have some in- fluence in deter- mining my goals.	Very much; I have a great deal of influence in deter- mining my goals.
Very little; I have little say in deter- mining my goals.	Moderately; I have some in- fluence in deter- mining my goals.	Very much; I have a great deal of influence in deter- mining my goals.	

11. How much feedback and guidance do you receive concerning the quantity and quality of your work?

1-----2-----3-----4-----5-----6-----7			
<table border="0"> <tr> <td style="vertical-align: top;">                 Very little;                  I receive al-                  most no feed-                  back concerning                  my goals.             </td> <td style="vertical-align: top; text-align: center;">                 Moderate                  feedback.             </td> <td style="vertical-align: top;">                 Very much; I                  receive constant                  feedback concerning                  my goals.             </td> </tr> </table>	Very little; I receive al- most no feed- back concerning my goals.	Moderate feedback.	Very much; I receive constant feedback concerning my goals.
Very little; I receive al- most no feed- back concerning my goals.	Moderate feedback.	Very much; I receive constant feedback concerning my goals.	



SECTION TWO

Listed below are a number of statements which could be used to describe a job.

You are to indicate whether each statement is an accurate or an inaccurate description of your job.

Once again, please try to be as objective as you can in deciding how accurately each statement describes your job--regardless of whether you like or dislike your job.

How accurate is the statement in describing your job?

1	2	3	4	5	6	7
Very Inaccurate	Mostly Inaccurate	Slightly Inaccurate	Uncertain	Slightly Accurate	Mostly Accurate	Very Accurate

12. The job requires me to use a number of complex or high-level skills.
13. The job is arranged so that I do not have the chance to do an entire piece of work from beginning to end.
14. Just doing the work required by the job provides many chances for me to figure out how well I am doing.
15. The job is quite simple and repetitive.
16. The supervisors on this job almost never give me any "feedback" about how well I am doing in my work.
17. This job is one where a lot of other people can be affected by how well the work gets done.
18. The job denies me any chance to use my personal initiative or judgment in carrying out the work.
19. Supervisors often let me know how well they think I am performing the job.
20. The job provides me the chance to completely finish the pieces of work I begin.

How accurate is the statement in describing your job?

1	2	3	4	5	6	7
Very	Mostly	Slightly	Uncertain	Slightly	Mostly	Very
Inaccurate	Inaccurate	Inaccurate		Accurate	Accurate	Accurate

21. The job itself provides very few clues about whether or not I am performing well.
22. The job gives me considerable opportunity for independence and freedom in how I do the work.
23. The job itself is not very significant or important in the broader scheme of things.
24. My work goals or objectives are very clear and specific; I know exactly what is expected of me.
25. My work goals will require a great deal of effort from me to complete them.
26. It will take a high degree of skill and know-how on my part to fully attain my work objectives.
27. I understand fully which of my work goals or objectives are more important than others; I have a clear sense of priorities on these goals.

SECTION THREE

ATTENTION: The following statements concern the job of your entire work group (team, section, etc). Please describe the overall job of your work group as objectively as you can.

How accurate is the statement in describing the job of your work group?

1	2	3	4	5	6	7
Very Inaccurate	Mostly Inaccurate	Slightly Inaccurate	Uncertain	Slightly Accurate	Mostly Accurate	Very Accurate

28. The overall task of our work group requires us to do many different things which require using a variety of skills and talents.
29. Our work group or team has considerable independence and freedom in how we do the work.
30. Doing the job itself provides us with direct information about how well we perform.
31. A lot of other people are affected by how well we do our job.
32. As a whole our work group uses a number of complex and high-level skills to get the job done.
33. Even when you consider all the tasks we do, we do not have a chance to do a whole piece of work from beginning to end.
34. The way we do our job significantly impacts on the lives or well being of other people.
35. Our work group or team has little chance to use its initiative or judgement in carrying out the work.
36. Our group is able to completely finish the work we start. That is, other groups do not finish the work we begin.
37. Just doing the job provides many chances for us to figure out how well our team as a whole is doing.

## SECTION FOUR

Listed below are a number of statements which could be used to describe your work relationships.

You are to indicate whether each statement is an accurate or an inaccurate description of your work relationships.

Once again, please try to be as objective as you can in deciding how accurately each statement describes your work relationships.

How accurate is the statement in describing your work relationships?

1	2	3	4	5	6	7
Very	Mostly	Slightly	Uncertain	Slightly	Mostly	Very
Inaccurate	Inaccurate	Inaccurate		Accurate	Accurate	Accurate

38. There is good rapport between superiors and the subordinates in this organization.
39. I am authorized to communicate with almost anyone in the entire organization.
40. My immediate supervisor communicates with me often.
41. For most situations there is an appropriate directive or regulation.
42. I am encouraged to be innovative in the performance of my tasks.
43. My supervisor provides me with adequate information to perform my job in the best manner.
44. Rewards and encouragement outweigh threats and criticism.
45. The working environment is relaxed.
46. The chain of command is strictly enforced.
47. It is hard to get people higher up in this organization to listen to people at my level.
48. I am encouraged to say what I really think.
49. Strict obedience of orders is important here.
50. The methods I use to do my job are specified in detail by my supervisor or by directives and regulations.

SECTION FIVE

Every employee produces something in his or her work. It may be a "product" or it may be a "service". It is sometimes difficult, however, to identify that product or service. Listed below are some of the products or services produced at your unit.

Aircraft serviced	Parts processed
Components repaired	Jobs completed
Forms processed	On-time departures
Aircraft operational ready	Reports prepared
Procedures written	Missions successful
Red X's and /'s cleared	

These are just a few of the products or services found at your unit. There are others, of course. We would like you to think carefully of the things you produce, and also of the things produced by those people who work with you in your work group (i.e., everyone who works for your boss).

There is a scale provided for each question. Select the response number (1 thru 5) that most accurately reflects the production in your work group.

51. Thinking now of the various things produced by the people you know in your work group, how much are they producing?

1-----2-----3-----4-----5  
 It is very    It is fairly    It is neither    It is fairly    Their production  
 low            low            high or low    high            is very high

52. How good would you say is the quality of the products or services produced by the people you know in your work group?

1-----2-----3-----4-----5  
 The quality    The quality    The quality    The quality    The quality  
 is poor        is not too    is fair        is good        is excellent  
                   good

53. Do the people in your work group seem to get maximum output from the resources (money, people, equipment, etc.) they have available? That is, how efficiently do they work?

1-----2-----3-----4-----5  
 They do not    Not too        Fairly        They are        They are  
 work effi-    efficient      efficient      very effi-      extremely  
 ciently                                      cient            efficient

SECTION SIX

Listed below are a number of statements which could be used to describe a job or work group.

You are to indicate whether each statement is an accurate or an inaccurate description of your job or work group.

Once again, please try to be as objective as you can in deciding how accurately each statement describes your job or work group--regardless of whether you like or dislike your job.

How accurate is the statement in describing your job or work group?

1	2	3	4	5	6	7
Very	Mostly	Slightly	Uncertain	Slightly	Mostly	Very
Inaccurate	Inaccurate	Inaccurate		Accurate	Accurate	Accurate

- 54. Members of my work group would do almost anything to help each other out on the job.
- 55. I like being (or would like to be) the "expert" in my work group for some system, task, or process.
- 56. If I were to be transferred to another work group, I would be very happy.
- 57. I do not want to learn new skills; I would rather just do what I already know how to do.
- 58. I have a high degree of commitment to my work group.
- 59. We pride ourselves on being able to produce more work than the other work groups in our squadron.
- 60. I am willing to teach my co-workers some of the "tricks of the trade" that I have learned about my specialty.
- 61. There is a great deal of competition between people in this work group.
- 62. I would be very upset if the members of my work group were to be split up into other work groups.
- 63. Members of my work group help each other out to get the job done.
- 64. There is pressure from others in my work group not to work too hard.
- 65. There is a great deal of competition between work groups around here.

How accurate is the statement in describing your job or work group?

1	2	3	4	5	6	7
Very Inaccurate	Mostly Inaccurate	Slightly Inaccurate	Uncertain	Slightly Accurate	Mostly Accurate	Very Accurate

66. The various work groups in this squadron cooperate closely to get the mission accomplished.
67. Members of my work group do as little work as they can get by with.
68. We check and recheck our work to make sure we have done the job right.
69. When there is a job to be done our work group always tries to outperform the other work groups.
70. I really enjoy being able to learn new skills.
71. There is a great deal of hostility between work groups around here.
72. The members of my work group are very concerned with doing high quality work.
73. Members of my work group are more concerned with their own individual performance than the performance of the group as a whole.
74. There is a spirit of cooperation between work groups around here.

SECTION SEVEN

Now please indicate how you personally feel about your job.

Each of the statements below is something that a person might say about his or her job. You are to indicate your own, personal feelings about your job by marking how much you agree with each of the statements.

How much do you agree with the statement?

1	2	3	4	5	6	7
Disagree Strongly	Disagree	Disagree Slightly	Neutral	Agree Slightly	Agree	Agree Strongly

75. In this organization people are rewarded in proportion to the excellence of their performance.
76. Generally speaking, I am very satisfied with this job.
77. There is a great deal of criticism in this organization.
78. I frequently think of quitting this job or asking for a transfer.
79. There are not enough rewards or recognition given in this organization for doing good work.
80. I am generally satisfied with the kind of work I do in this job.



SECTION EIGHT

Now please indicate how satisfied you are with each aspect of your job listed below. Once again, indicate the appropriate number on the scoring sheet.

How satisfied are you with this aspect of your job?

1	2	3	4	5	6	7
Extremely Dissatis- fied	Dissatisfied	Slightly Dissatis- fied	Neutral	Slightly Satisfied	Satisfied	Extremely Satisfied

81. The people I talk to and work with on my job.
82. The degree of respect and fair treatment I receive from my boss.
83. The chance to get to know other people while on the job.
84. The amount of support and guidance I receive from my supervisor.
85. The chance to help other people while at work.
86. The overall quality of the supervision I have received in my work.

SECTION NINE

Listed below are a number of characteristics which could be present on any job. People differ about how much they would like to have each one present in their own jobs. We are interested in learning how much you personally would like to have each one present in your job.

Using the scale below, please indicate the degree to which you would like to have each characteristic present in your job.

NOTE: The numbers on this scale are different from those used in previous scales.

4-----5-----6-----7-----8-----9-----10																		
<table border="0" style="width: 100%;"> <tr> <td style="width: 33%;">Would like</td> <td style="width: 33%;">Would like</td> <td style="width: 33%;">Would like</td> </tr> <tr> <td>having this</td> <td>having this</td> <td>having this</td> </tr> <tr> <td>only a</td> <td>very much</td> <td><u>extremely</u></td> </tr> <tr> <td>moderate</td> <td></td> <td>much</td> </tr> <tr> <td>amount (or</td> <td></td> <td></td> </tr> <tr> <td>less)</td> <td></td> <td></td> </tr> </table>	Would like	Would like	Would like	having this	having this	having this	only a	very much	<u>extremely</u>	moderate		much	amount (or			less)		
Would like	Would like	Would like																
having this	having this	having this																
only a	very much	<u>extremely</u>																
moderate		much																
amount (or																		
less)																		

87. A high degree of job security.
88. Opportunities for personal growth and development on the job.
89. Fairly difficult and challenging work assignments.
90. Working as a member of a group rather than by myself.
91. Very high pay.
92. Chances to exercise independent thought and action in my job.
93. A low-risk job where I do not have to stick my neck out to get ahead.
94. Opportunities to socialize with my co-workers.
95. Stimulating and challenging work.
96. Working alone on the job instead of with a group of people.
97. A great deal of responsibility.
98. Generous retirement benefits.
99. Opportunities to be creative and imaginative in my work.
100. Working in an open area where I can see and talk to my associates or co-workers.
101. A sense of worthwhile accomplishment in my work.
102. A dangerous job.
103. Opportunities to learn new things from my work.
104. Chances to work together with others in carrying out the job.

SECTION TEN

Now please indicate how you personally feel about your job.

Each of the statements below is something that a person might say about his or her job. You are to indicate your own, personal feelings about your job by indicating how much you agree with each of the statements.

How much do you agree with the statements?

1	2	3	4	5	6	7
Disagree	Disagree	Disagree	Neutral	Agree	Agree	Agree
Strongly		Slightly		Slightly		Strongly

105. I am willing to put a great deal of effort beyond that normally expected in order to help this squadron be successful.
106. I feel very little loyalty to this squadron.
107. I feel I would accept almost any type job assignment in order to keep working for this squadron.
108. I could just as well be working for a different squadron as long as the type of work was similar.

SECTION ELEVEN

For the following questions choose the response that best reflects your feeling about your job. Indicate the number that most accurately reflects your feelings.

109. Which one of the following shows how much of the time you feel satisfied with your job?
1. All the time.
  2. Most of the time.
  3. A good deal of the time.
  4. About half of the time.
  5. Occasionally.
  6. Seldom.
  7. Never.
110. Choose the one of the following statements which best tells how well you like your job.
1. I hate it.
  2. I dislike it.
  3. I don't like it.
  4. I am indifferent to it.
  5. I like it.
  6. I am enthusiastic about it.
  7. I love it.
111. Which one of the following best tells how you feel about changing your job?
1. I would quit this job at once if I could.
  2. I would take almost any other job in which I could earn as much as I am earning now.
  3. I would like to change both my job and my occupation.
  4. I would like to exchange my present job for another one.
  5. I am not eager to change my job, but I would do so if I could get a better job.
  6. I cannot think of any jobs for which I would exchange.
  7. I would not exchange my job for any other.
112. Which one of the following shows how you think you compare with other people?
1. No one likes his job better than I like mine.
  2. I like my job much better than most people like theirs.
  3. I like my job better than most people like theirs.
  4. I like my job about as well as most people like theirs.
  5. I dislike my job more than most people dislike theirs.
  6. I dislike my job much more than most people dislike theirs.
  7. No one dislikes his job more than I dislike mine.

SECTION TWELVE

Listed below are a number of statements which could be used to describe a job.

- \* If a statement describes your job mark the "Y" block on the scoring sheet.
- \* If a statement does not describe your job mark the "N" block on the scoring sheet.
- \* If you cannot decide if a statement describes your job mark a "?" on the scoring sheet.

- 113. Interesting
- 114. Boring
- 115. Good
- 116. Cool
- 117. Useful
- 118. Pleasant
- 119. Like to come to work
- 120. Exhausting
- 121. Challenging
- 122. Routine
- 123. Satisfying
- 124. Gives a sense of accomplishment
- 125. Simple
- 126. Fulfilling
- 127. Endless
- 128. Frustrating
- 129. Respected
- 130. Fun

THANK YOU FOR YOUR PARTICIPATION

APPENDIX C  
SUMMARY OF MEAN VALUES FOR JOB  
ATTITUDE SURVEY

	Hill AFB			Homestead AFB			Seymour Johnson AFB					
	<u>Mean</u>		<u>Standard Deviation</u>	<u>Mean</u>		<u>Standard Deviation</u>	<u>Mean</u>		<u>Standard Deviation</u>			
	<u>Before</u>	<u>After</u>	<u>Before</u>	<u>After</u>	<u>Before</u>	<u>After</u>	<u>Before</u>	<u>After</u>	<u>Before</u>	<u>After</u>		
F1	3.43	3.34	1.25	1.26	3.75	3.77	1.27	1.34	3.61	3.33	1.36	1.30
F2	4.94	4.64	1.06	1.27	5.14	4.74	1.06	1.34	5.05	4.79	1.20	1.30
F3	2.38	2.35	.98	.89	2.60	2.91	1.15	1.24	2.58	2.83	1.04	1.15
F4	3.71	3.64	.67	.60	3.82	3.66	.60	.71	3.76	3.67	.65	.70
F5	4.58	4.47	.69	.64	4.68	4.48	.68	.63	4.65	4.52	.67	.72
F6	5.71	5.78	.91	.77	5.94	5.69	.83	.97	5.76	5.69	.97	1.01
F7	4.54	4.37	1.05	1.11	4.89	4.55	1.15	1.24	4.69	4.57	1.12	1.12
F8	5.08	4.96	.94	.88	5.34	4.87	1.03	1.15	5.10	4.93	1.13	1.20
F9	4.60	4.60	1.06	1.27	4.80	4.53	1.30	1.39	4.43	4.39	1.46	1.40
F10	4.16	4.06	1.60	1.70	4.61	4.32	1.53	1.53	4.47	4.28	1.62	1.57
F11	4.97	4.97	1.01	1.24	5.14	4.78	1.01	1.28	5.14	4.90	1.17	1.18
F12	4.44	4.29	1.19	1.02	4.81	4.66	1.07	1.12	4.55	4.31	1.09	1.41

APPENDIX D  
ANALYSIS OF COVARIANCE DATA SHEETS



ANALYSIS OF COVARIANCE  
 FAGE KWATS (CREATION GAS = 08/03/78)  
 \* \* \* \* \* M U L T I P L I C A T I O N \* \* \* \* \* VARIABLE LIST 1  
 REGRESSION LIST 1

DEPENDENT VARIABLE: F1  
 GROUP CHARACTERISTICS: NONE  
 VARIABLE(S) ENTERED ON STEP NUMBER 1: D1  
 D2

ANALYSIS OF VARIANCE  
 REGRESSION  
 RESIDUAL

VARIABLE	B	BETA	STD ERROR B	F	SUM OF SQUARES	MEAN SQUARE	PARTIAL TOLERANCE
F1	0.4778	0.1883	0.1978	4.716	15.8378	15.8378	0.8934
(CONSTANT)	0.5235	-0.0100	0.1797	0.021	681.7257	7.3167	0.2501
						3.7219	0.2260

----- VARIABLE(S) ENTERED ON STEP NUMBER 2: F1

VARIABLE	B	BETA	STD ERROR B	F	SUM OF SQUARES	MEAN SQUARE	PARTIAL TOLERANCE
F1	0.5180	0.1653	0.1514	2.373	204.7728	59.2578	0.7289
(CONSTANT)	0.3114	0.1514	0.1514	4.517	452.7908	1.2047	-0.1307
							0.1068

----- VARIABLE(S) ENTERED ON STEP NUMBER 3: F1

VARIABLE	B	BETA	STD ERROR B	F	SUM OF SQUARES	MEAN SQUARE	PARTIAL TOLERANCE
F1	0.2589	0.0864	0.1653	2.373	204.7728	59.2578	0.7289
F2	0.1189	0.0451	0.1514	4.517	452.7908	1.2047	-0.1307
F3	0.5398	0.1537	0.0830	156.893			0.1068
(CONSTANT)							

08/08/78 PAGE 10

ANALYSIS OF COVARIANCE  
FILE NAME (OPERATION DATE = 08/08/78)  
..... MULTIPLE REGRESSION ..... VARIABLE LIST  
.....  
DEPENDENT VARIABLE.. ZP1 GROUP CEMENT-REWARDS  
VARIABLES ENTERED ON STEP NUMBER 3.. DZP1  
DZP1

MULTIPLE R 0.5666 ANALYSIS OF VARIANCE DF SUM OF SQUARE MEAN SQUARE F  
R SQUARE 0.2329 REGRESSION 5 212.7798 42.5597 15.7235  
ADJUSTED R SQUARE 0.3145 RESIDUAL 374 644.7893 1.18926  
STANDARD ERROR 1.0905

..... VARIABLES IN THE EQUATION .....

VARIABLE	B	BETA	S.D. ERROR	F	VARIABLE	BETA	PARTIAL TOLERANCE
Z1	0.01166	0.00403	0.12750	0.021			
Z2	0.53110	0.12477	0.43743	1.871			
Z3	0.62543	0.15215	0.10353	36.520			
Z4	0.15504	0.12472	0.11634	2.128			
Z5	0.05747	0.08105	0.13190	0.192			
(CONSTANT)	1.19267						

..... VARIABLES NOT IN THE EQUATION .....

ALL VARIABLES ARE IN THE EQUATION

ANALYSIS OF COVARIANCE  
FILE NUMBER (CREATION DATE = 08/08/78)  
08/06/78 PAGE 12

DEPENDENT VARIABLE 7P2 GROUP CHARACTERISTICS AND REPORT  
VARIABLES ENTERED ON STEP NUMBER 1, 2 D1 D2  
NONRESIDUAL (7P) SEARCH VARIANCE APP

MEANS	0.15000
Z	2.00000
ADJUSTED R SQUARE	0.60000
STANDARD ERROR	0.20000

SUM OF SQUARES	MEAN SQUARE
2.00000	1.00000
607.62981	1.01112

VARIABLE LEFT 2  
REGRESSION WISE 1

ANALYSIS OF VARIANCE OF REGRESSION RESIDUAL

REGRESSION	0.272
RESIDUAL	1.018

VARIABLES IN THE EQUATION

B	BETA	STD ERROR B	F
01	0.10005	0.02601	0.15077
02	0.19315	0.07616	0.17095
(CONSTANT)	4.54235		

VARIABLES NOT IN THE EQUATION

BETA JK	PARTIAL TOLERANCE
0.47963	0.01552
1.17106	0.01630
0.02501	0.05073
1.08713	0.034158
	0.10230
	0.1756

ANALYSIS OF VARIANCE OF REGRESSION RESIDUAL

REGRESSION	0.100
RESIDUAL	0.172

VARIABLES IN THE EQUATION

B	BETA	STD ERROR B	F
01	0.10005	0.02601	0.15077
02	0.19315	0.07616	0.17095
(CONSTANT)	4.54235		

VARIABLES NOT IN THE EQUATION

BETA JK	PARTIAL TOLERANCE
0.47963	0.01552
1.17106	0.01630
0.02501	0.05073
1.08713	0.034158
	0.10230
	0.1756

ANALYSIS OF VARIANCE OF REGRESSION RESIDUAL

REGRESSION	0.100
RESIDUAL	0.172

VARIABLES IN THE EQUATION

B	BETA	STD ERROR B	F
01	0.10005	0.02601	0.15077
02	0.19315	0.07616	0.17095
(CONSTANT)	4.54235		

VARIABLES NOT IN THE EQUATION

BETA JK	PARTIAL TOLERANCE
0.47963	0.01552
1.17106	0.01630
0.02501	0.05073
1.08713	0.034158
	0.10230
	0.1756

ANALYSIS OF COVARIANCE  
FILE MCNAME (CREATION DATE = 08/08/78)  
.....  
DEPENDENT VARIABLE: TP2 GROUP CLIMATE-COMMUNICATIONS AND SUPPORT  
VARIABLE(S) ENTERED ON STEP NUMBER 3: D2P2  
D1P2

.....  
VARIABLE LIST 2  
REGRESSION LIST 1  
.....  
MEASURE R  
R SQUARE R SQUARE  
STANDARD ERROR  
.....  
ANALYSIS OF VARIANCE  
S1  
S2  
RESIDUAL  
.....  
SUM OF SQUARES  
182.85888  
486.86699  
.....  
MEAN SQUARE  
28.57137  
1.20831  
.....  
F  
22.68799

.....  
VARIABLES IN THE EQUATION  
.....  
VARIABLES NOT IN THE EQUATION  
.....  
VARIABLE B BETA SSD ERROR S F  
D1 0.43772 0.15762 0.92263 0.283  
D2 0.25235 0.09956 0.72826 0.171  
P2 0.53072 0.187231 17.825 17.825  
D2P2 0.02379 0.05009 0.14350 0.022  
D1P2 0.02393 0.15990 0.16042 0.174  
(CONSTANT) 2.02038

ALL VARIABLES ARE IN THE EQUATION

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ANALYSIS OF COVARIANCE

FILE NAME: (CREATION DATE = 08/06/78)

..... MULTIPLE REGRESSION ..... VARIABLE TEST F  
REGRESSIONS TEST F

DEPENDENT VARIABLE: YP3 GROUP CUMULATE-STRUCTURE

VARIABLE(S) ENTERED ON STEP NUMBER 1: D1 HARBORLAND AFD  
D2 STRONG JOHNSON AFD

MULTIPLE R 0.1784 ANALYSIS OF VARIANCE OF SUM OF SQUARES MEAN SQUARE F  
Y PREDICTED 0.02057 REPRESSION 2. 15.73725 7.56893 5.84383  
ADJUSTED R SQUARE 0.02543 RESIDUAL 377. 480.07777 1.27342  
STANDARD ERROR 1.12846

----- VARIABLES IN THE EQUATION ----- VARIABLES NOT IN THE EQUATION -----  
VARIABLE B BETA STD ERROR B F VARIABLE BETA IN PARTIAL CORRELANCE F  
D1 0.56024 0.72367 0.17006 10.754 D2 0.64054 0.65714 0.99440 76.737  
D2 0.45260 0.20225 0.15551 8.120 D1P3 0.49145 0.23173 0.21554 21.337  
(CONSTANT) 2.30764 D2P3 0.170436 0.35841 0.35073 55.345

..... GROUP CLEAR-STRUCTURE .....

VARIABLE(S) ENTERED ON STEP NUMBER 2: F3

MULTIPLE R 0.17755 ANALYSIS OF VARIANCE OF SUM OF SQUARES MEAN SQUARE F  
Y PREDICTED 0.24805 REPRESSION 3. 112.93355 37.64442 7  
ADJUSTED R SQUARE 0.22169 RESIDUAL 3764 382.28476 1.05021 51.02003  
STANDARD ERROR 1.06832

----- VARIABLES IN THE EQUATION ----- VARIABLES NOT IN THE EQUATION -----  
VARIABLE B BETA STD ERROR B F VARIABLE BETA IN PARTIAL CORRELANCE F  
D1 0.45708 0.18271 0.15757 8.979 D2P3 -0.12742 -0.10505 0.74119 0.79  
D2 0.35939 0.16645 0.13328 7.017 D1 0.15580 0.68836 0.72114 1.541  
D3 0.45703 0.44594 0.06830 96.489  
(CONSTANT) 1.42048

ANALYSIS OF COVARIANCE  
 FILE NAME (CREATION DATE = 08/08/78)  
 \* \* \* \* \* REGRESSION \* \* \* \* \* VARIABLE LIST 3  
 DEPENDENT VARIABLE: YPJ GROUP CLIMATE-STRUCTURE REPRESSION LIST 1  
 VARIABLES ENTERED ON STEP NUMBER 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100

MULTIPLE R 0.78078  
 T-SQUARE 0.23115  
 ADJUSTED R SQUARE 0.72087  
 STANDARD ERROR 1.00828

ANALYSIS OF VARIANCE

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F
REGRESSION	3	118.87000	22.88812	22.48834
RESIDUAL	378	380.78502	1.01803	

VARIABLES IN THE EQUATION

VARIABLE	BETA	STD ERROR B	F	PARTIAL TOLERANCE
D1	0.87323	0.18900	14.817	
D2	0.07238	0.03167	9.028	
D3	0.82075	0.33093	11.781	
D73	0.11941	0.15572	9.717	
D78	0.00722	0.18862	0.000	
(CONSTANT)	1.38857			

ALL VARIABLES ARE IN THE EQUATION

ANALYSIS OF COVARIANCE  
TITLE WORKNAME (REGISTRATION DATE = 08/08/78)  
\*\*\*\*\* M U L T I P L I R E G R E S S I O N \*\*\*\*\* V A R I A B L E L I S T  
DEPENDENT VARIABLE, YDN WORK GROUP PRODUCTIVITY  
VARIABLE(S) ENTERED ON STEP NUMBER 1: D1 NONSTANDARD APP  
D2 SEYMOUR JOHNSON APP

MULTIPLE R 0.00736 ANALYSIS OF VARIANCE OF SUM OF SQUARES MEAN SQUARE F  
F SQUARE 0.00005 REGRESSION 0.00932 0.00866 0.01020  
ADJUSTED R SQUARE -0.00525 RESIDUAL 172.18816 0.45562  
STANDARD ERROR 0.67374

----- VARIABLES IN THE EQUATION -----  
VARIABLE B BETA STD ERROR B F  
D1 0.01210 0.160905 0.10207 0.017  
D2 0.01210 0.160908 0.09312 0.017  
(CONSTANT) 3.60458  
----- VARIABLES NOT IN THE EQUATION -----  
VARIABLE BETA IN PARTIAL TOLERANCE F  
P4 0.82839 0.42352 0.95535 82.185  
D1P4 0.73585 0.43533 0.83382 7.015  
D2P4 1.68322 0.36167 0.05811 69.413

\*\*\*\*\* WORK GROUP PRODUCTIVITY \*\*\*\*\*  
VARIABLE(S) ENTERED ON STEP NUMBER 2: P4  
ANALYSIS OF VARIANCE OF SUM OF SQUARES MEAN SQUARE F  
F SQUARE 0.00158 REGRESSION 30.88767 10.29059 27.40366  
ADJUSTED R SQUARE 0.17267 RESIDUAL 141.26781 0.37571  
STANDARD ERROR 0.61225

----- VARIABLES IN THE EQUATION -----  
VARIABLE B BETA STD ERROR B F  
D1 0.00261 0.09275 0.155  
D2 0.00261 0.09275 0.155  
P4 0.99672 0.12849 0.002  
(CONSTANT) 1.98585  
----- VARIABLES NOT IN THE EQUATION -----  
VARIABLE BETA IN PARTIAL TOLERANCE F  
D1P4 -0.15975 -0.10430 0.02192 5.124  
D2P4 0.66518 0.11749 0.02721 5.229

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ANALYSIS OF COVARIANCE  
FILE FORNAME (CREATION DATE = 08/06/78)  
\*\*\*\*\*  
DEPENDENT VARIABLE, . 774 WORK GROUP PRODUCTIVITY  
VARIABLE(S) ENTERED ON STEP NUMBER 3, . D274  
D178

MEANS 0.42814 ANALYSIS OF VARIANCE OF SUM OF SQUARES MEAN SQUARE F  
R SQUARE 0.19176 REGRESSION 33.08755 6.86351 17.77007  
ADJUSTED R SQUARE 0.18116 RESIDUAL 374. 159.10792 0.41705  
STANDARD ERROR 0.60667

----- VARIABLES IN THE EQUATION -----  
VARIABLE 3 2 DETA STD ERROR B F  
D1 0.32867 0.26056 -0.25108 0.888  
D2 -0.59828 0.45993 0.48080 1.656  
D3 0.38710 0.34873 0.10780 12.928  
D774 0.16886 0.47785 0.12705 3.676  
D178 -0.16850 0.12859 0.18828 0.1584  
(CONSTANT) 2.20587

----- VARIABLES NOT IN THE EQUATION -----  
VARIABLE 3 2 PARTIAL TOLERANCE F  
ALL VARIABLES ARE IN THE EQUATION



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ANALYSIS OF COVARIANCE  
FILE NUMBER (OPERATION DATE 06/08/78) . . . . . VARIABLE LIST 1  
 . . . . . REGRESSION LIST 1  
DEPENDENT VARIABLE: F25  
VARIABLE(S) ENTERED ON STEP NUMBER 1: B2 B3  
SYMOUR JOHNSON AFB  
MCHESTER AFB  
COMMENT

ANALYSIS OF VARIANCE  
REGRESSION  
RESIDUAL  
SUM OF SQUARES  
MEAN SQUARE  
F  
T

VARIABLES IN THE EQUATION  
VARIABLE  
B  
BETA  
STD ERROR B  
REGRESSION  
RESIDUAL  
SUM OF SQUARES  
MEAN SQUARE  
F  
T

VARIABLES NOT IN THE EQUATION  
VARIABLE  
B  
BETA  
STD ERROR B  
REGRESSION  
RESIDUAL  
SUM OF SQUARES  
MEAN SQUARE  
F  
T

VARIABLES IN THE EQUATION  
VARIABLE  
B  
BETA  
STD ERROR B  
REGRESSION  
RESIDUAL  
SUM OF SQUARES  
MEAN SQUARE  
F  
T

VARIABLES NOT IN THE EQUATION  
VARIABLE  
B  
BETA  
STD ERROR B  
REGRESSION  
RESIDUAL  
SUM OF SQUARES  
MEAN SQUARE  
F  
T

ANALYSIS OF COVARIANCE  
FILE NOFARE (CREATION DATE = 08/08/78)  
..... VARIABLE LIST 1  
..... REGRESSION LIST 1

DEPENDENT VARIABLE.. F75 COMMENT  
VARIABLE(S) ENTERED ON THIS NUMBER 3.. D75  
D175

MULTIPLE R	0.2989	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F
R SQUARE	0.07838	REGRESSION	3	13.43333	2.68667	6.35786
ADJUSTED R SQUARE	0.06602	RESIDUAL	331	158.04266	0.42257	
STANDARD ERROR	0.55006					

..... VARIABLES IN THE EQUATION .....

VARIABLE	B	BETA	STD ERROR B	F
D2	0.58302	0.43378	0.61388	0.902
D1	-0.25489	-0.19281	0.67808	0.191
F3	0.18507	0.14532	0.11207	2.727
D2F5	0.13090	0.47745	0.13199	1.045
D1F5	0.06481	0.20223	0.16888	0.189

..... VARIABLES NOT IN THE EQUATION .....

VARIABLE	BETA IN	PARTIAL	TOLERANCE	F

ALL VARIABLES ARE IN THE EQUATION

ANALYSIS OF COVARIANCE  
 TITLE SOURCE (CREATION DATE = 08/08/78)  
 \* \* \* \* \* M U L T I P L E R E G R E S S I O N \* \* \* \* \* VARIABLE LIST 2  
 DEPENDENT VARIABLE.. YP6 SKILLS REGRESSION LIST 1  
 VARIABLES ENTERED ON STEP NUMBER 1: D1 HONDSHEAD AFB  
 D2 SYMOUR JOHNSON AFB

COEFFICIENTS OF VARIANCE SS SUM OF SQUARES MEAN SQUARE F  
 REGRESSION 2 381.19041 0.36706 0.45353 0.20279  
 RESIDUAL 377. 0.90501

ANALYSIS OF VARIANCE SS MEAN SQUARE F  
 REGRESSION 2 381.19041 0.36706 0.45353 0.20279  
 RESIDUAL 377. 0.90501

VARIABLES IN THE EQUATION  
 VARIABLE B BETA STD ERROR B F  
 D1 0.06671 0.04170 0.14370 0.1368  
 D2 0.07268 0.13381 0.13110 0.1307  
 (CONSTANT) 5.77778

VARIABLES NOT IN THE EQUATION  
 VARIABLE BETA IN PARTIAL TOLERANCE F  
 P6 0.43180 0.43011 0.49118 85.147  
 D1P6 1.24455 0.23570 0.62635 22.117  
 D2P6 1.48730 0.33811 0.65162 48.532

VARIABLE(S) ENTERED ON STEP NUMBER 2: 76 SKILLS  
 ANALYSIS OF VARIANCE DF SUM OF SQUARES MEAN SQUARE F  
 REGRESSION 3 63.48538 21.49513 26.61428  
 RESIDUAL 376. 278.67210 0.73955

VARIABLES IN THE EQUATION  
 VARIABLE B BETA STD ERROR B F  
 D1 0.09056 0.09164 0.13039 2.116  
 D2 0.15473 0.10524 0.11856 0.781  
 D3 0.48337 0.14380 0.09910 5.827  
 (CONSTANT) 3.18016

VARIABLES NOT IN THE EQUATION  
 VARIABLE BETA IN PARTIAL TOLERANCE F  
 P6 0.17891 0.42798 0.41542 0.224  
 D1P6 0.15374 0.62558 0.64254 0.246

ANALYSIS OF COVARIANCE  
 TITLE REGANE (CREATION DATE = 08/08/78)  
 \* \* \* \* \*  
 DEPENDENT VARIABLE: TP6 SKILLS  
 TABLE(S) ENTERED ON STEP NUMBER 3.0 D276  
 D176

MULTIPLE R 0.83498  
 F SOURCE 0.11772  
 ADJUSTED R SQUARE 0.17038  
 STANDARD ERROR 0.88050

MEASURE OF VARIANCE OF  
 REGRESSION  
 RESIDUAL

SUM OF SQUARES  
 68.82796  
 276.92951

MEAN SQUARE  
 12.92559  
 0.78045

F  
 17.45633

..... VARIABLES IN THE EQUATION .....

VARIABLE	B	BETA	STD ERROR B	T	PARTIAL TOLERANCE
D1	1.17752	0.56027	0.66188	1.793	
D2	0.39825	0.49515	0.75708	1.580	
D3	0.22921	0.31381	0.14288	8.511	
D4	0.18574	0.85850	0.13088	7.288	
D5	0.17287	0.49481	0.18001	1.297	
(CONSTANT)	3.82671				

..... VARIABLES NOT IN THE EQUATION .....

ALL VARIABLES ARE IN THE EQUATION

ANALYSIS OF COVARIANCE  
 TEST STATISTIC (CORRECTION RATE = 0.01/0.0178)  
 . . . . .  
 DEPENDENT VARIABLE, P27 MONTHS  
 VARIABLE(S) ENTERED ON STEP NUMBER 11, D1  
 D2  
 NONSTANDARD APRA  
 BETHOUX JOHNSON APA

COEFFICIENT B 0.06103  
 B SQUARE 0.00369  
 ADJUSTED P SQUARE = 0.00079  
 STANDARD ERROR 1.15532

ANALYSIS OF VARIANCE (F)  
 REGRESSION 2  
 RESIDUAL 377

SUM OF SQUARES 2.27178  
 MEAN SQUARE 1.33583

PROBABILITY < F 0.85071

VARIABLES IN THE EQUATION  
 VARIABLE B STD ERROR B F  
 D1 0.18208 0.07195 1.088  
 D2 0.20373 0.06826 1.637  
 (CONSTANT) 8.37753

VARIABLES NOT IN THE EQUATION  
 VARIABLE BETA IN PARTIAL TOLERANCE F  
 P7 0.22081 0.98834 0.5890  
 P27 0.12188 0.07255 1.69  
 P277 0.63846 0.120753 0.12518 18.323

VARIABLE(S) ENTERED ON STEP NUMBER 21, P7 MONTHS  
 COEFFICIENT B 0.32582  
 B SQUARE 0.10618  
 ADJUSTED P SQUARE 0.10372  
 STANDARD ERROR 1.09222

ANALYSIS OF VARIANCE (F)  
 REGRESSION 3  
 RESIDUAL 376

SUM OF SQUARES 57.02577  
 MEAN SQUARE 17.26957

PROBABILITY < F 15.91037

VARIABLES IN THE EQUATION  
 VARIABLE B STD ERROR B F  
 D1 0.06302 0.12515 0.187  
 D2 3.18928 0.18078 0.698  
 P7 1.31632 0.33100 0.62028 85.890  
 (CONSTANT) 2.82708

VARIABLES NOT IN THE EQUATION  
 VARIABLE BETA IN PARTIAL TOLERANCE F  
 D177 0.18668 0.04328 0.495 0.85  
 D277 -0.119505 -0.0404651 0.25644 0.513

ANALYSIS OF COVARIANCE  
 TEST SOURCE (CREATION DATE = 01/01/78)  
 \* \* \* \* \* MULTIPLE REGRESSION \* \* \* \* \* VARIABLE LIST 1  
 DEPENDENT VARIABLE: P97 REGIONS REPRESSION LIST 1  
 VARIABLE(S) ENTERED ON STEP NUMBER 3.. DFP1  
 D1P7

MULTIPLE R	0.33889	SUM OF SQUARES	MEAN SQUARE	F
R SQUARE	0.11871	58.00216	11.50043	6.69186
ADJUSTED R SQUARE	0.10287	807.68282	1.11962	
STANDARD ERROR	1.09908			

VARIABLES IN THE EQUATION			VARIABLES NOT IN THE EQUATION		
VARIABLE	B	STD ERROR B	VARIABLE	BETA IN	PARTIAL TOLERANCE
Q1	0.00328	0.23003			
D1	0.51630	0.66300			
T1	0.38037	0.12312			
S2P1	0.08763	0.11950			
S2P7	0.01022	0.02171			
(CONSTANT)	2.68289	0.15222			

ALL VARIABLES ARE IN THE EQUATION

ANALYSIS OF COVARIANCE  
 TITLE MONAPE (CREATION DATE = 06/08/74)  
 . . . . . MULTIPLE REGRESSION . . . . . VARIABLE LIST 8  
 DEPENDENT VARIABLE.. 788 INTRAGROUP COOPERATION . . . . . REGRESSION LIST 1  
 VARIABLE(S) ENTERED OR STEP NUMBER 1cc D1 D2 HORNFIELD AFB  
 STEPHEN JOHNSON AFB

MULTIPLE R 0.62188  
 F SCORE 0.00100  
 ADJUSTED R SQUARE 0.00830  
 STANDARD ERROR 1.13557

ANALYSIS OF VARIANCE OF  
 REGRESSION 2  
 RESIDUAL 377  
 SUM OF SQUARES 486.83629  
 MEAN SQUARE 1.29134  
 F 9.16991

VARIABLE B BETA STD ERROR B F  
 D1 60.09513 -0.03854 0.17165 0.1311  
 D2 60.02843 -0.01241 0.15460 0.032  
 (CONSTANT) 4.96751 0.278 0.278 0.0229

VARIABLE BETA IN PARTIAL TOLERANCE F  
 D1 0.31918 0.38994 0.28016 67.825  
 D2 0.93854 0.20820 0.34937 17.037  
 (CONSTANT) 1.03929 0.32460 0.69208 48.283

ANALYSIS OF VARIANCE BY  
 REGRESSION 3  
 RESIDUAL 176  
 SUM OF SQUARES 78.51380  
 MEAN SQUARE 0.44572  
 F 0.015

VARIABLE BETA IN PARTIAL TOLERANCE F  
 D1 0.83086 0.06536 0.53596 0.766  
 D2 5.21890 0.04572 0.03852 0.766  
 (CONSTANT) 67.825 1.09760 22.62313

```

ANALYSIS OF COVARIANCE
FILE NAME (CREATION DATE = 08/09/78)
***** MULTIPLE REGRESSION ***** VARIABLE LIST
DEPENDENT VARIABLE 176 INTERGROUP COOPERATION
VARIABLE(S) ENTERED ON STEP NUMBER 3. D228
D174

MULTIPLE R 0.99872 ANALYSIS OF VARIANCE DF SUM OF SQUARE MEAN SQUARE F
F SQUARE 0.13738 REGRESSION 51 76.69746 15.03849 3.9725
ADJUSTED R SQUARE 0.18532 RESIDUAL 1741 410.82672 1.09793
STANDARD ERROR .02782

***** VARIABLES IN THE EQUATION *****
VARIABLE B BETA STD ERROR F
D1 0.13738 0.04079 1.685
D2 0.20215 0.14817 2.104
D3 0.23523 0.23199 3.471
D228 0.20616 0.40899 1.978
D174 0.17520 0.16539 1.8203
(CONSTANT)

***** VARIABLES NOT IN THE EQUATION *****
VARIABLE BETA IN PARTIAL TOLERANCE F
D7

```

ALL VARIABLES ARE IN THE EQUATION



ANALYSIS OF VARIANCE  
 TITLE ROUTE (CORRELATION DATE = 08/29/76)  
 . . . . . MULTIPLE REGRESSION . . . . . VARIABLE LIST 1  
 . . . . . REPRESSION LIST 1

DEPENDENT VARIABLE: F9 INTERGROUP COOPERATION  
 VARIABLE(S) FIXED ON STEP NUMBER 1: D1  
 02  
 2: HONESTY AND  
 3: YOUR JOHNSON AFB

SUMMARY OF RESULTS  
 VARIABLE R BETA STD ERROR B F  
 D1 -0.07407 -0.02457 0.12085 0.427  
 D2 -0.20170 -0.07334 0.18991 1.129  
 (CONSTANT) 4.63139

ANALYSIS OF VARIANCE  
 REGRESSION  
 RESIDUAL  
 377.  
 716.19804  
 SUM OF SQUARES  
 2.56816  
 716.19804  
 MEAN SQUARE  
 .118408  
 1.89708  
 F  
 0.57687

VARIABLES IN THE EQUATION  
 VARIABLE BETA IN PARTIAL TOLERANCE F  
 F9 0.35382 0.35174 0.48643 51.098  
 D1F9 0.51706 0.15825 0.39334 9.659  
 D2F9 0.69050 0.27414 0.18254 35.553

VARIABLES NOT IN THE EQUATION  
 VARIABLE BETA IN PARTIAL TOLERANCE F  
 D1 0.11563 0.03222 0.61751 2.392  
 D2 50.06219 0.00071 0.07132 0.600

VARIABLES IN THE EQUATION  
 VARIABLE BETA STD ERROR B F  
 D1 -0.04868 -0.04795 0.11326 0.548  
 D2 -0.18198 -0.05163 0.17813 2.636  
 (CONSTANT) 2.24659 0.35352 0.33335 53.028

VARIABLES NOT IN THE EQUATION  
 VARIABLE BETA IN PARTIAL TOLERANCE F  
 D1F9 0.11563 0.03222 0.61751 2.392  
 D2F9 50.06219 0.00071 0.07132 0.600

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ANALYSIS OF COVARIANCE

FILE: ACTA15 (CREATION DATE = 09/03/78)

..... MULTIPLE REGRESSION P \* \* \* \* \* VARIABLES LIST \*  
 ..... REPRESSION LIST \*

DEPENDENT VARIABLE: P22 ENTGROUP COOPERATION

VARIABLE(S) ENTERED ON STEP NUMBER 3.. 02P  
 01P9

MODEL 1 0.05915  
 S-SQUARE 0.12713  
 ADJUSTED R-SQUARE 0.11740  
 STANDARD ERROR 1.20260

ANALYSIS OF VARIANCE  
 REGRESSION  
 RESIDUAL

DF  
 5  
 374

SUM OF SQUARES  
 92.68441  
 625.08179

MEAN SQUARE  
 18.53688  
 1.67134

F  
 11.09302

----- VARIABLES IN THE EQUATION -----

VARIABLE	B	STDEV	STDEV B	F
C1	0.04931	0.21390	0.82761	0.616
C2	0.41323	0.15026	0.74289	0.309
C3	5.47872	0.87162	0.14435	11.043
C2P	-0.42067	-0.21071	0.15763	0.886
C1P	-3.17039	-0.12680	0.17293	0.976
(CONSTANT)	2.31390			

----- VARIABLES NOT IN THE EQUATION -----

VARIABLE	BETA IN	PARTIAL	TOLERANCE	F
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ALL VARIABLES ARE IN THE EQUATION

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ANALYSIS OF COVARIANCE  
 TITLE: HUMAN PERFORMANCE RATE # 6729/761  
 VARIABLE LIST 2  
 REGRESSION LIST 1

DESCRIPTIVE STATISTICS: F100 GENERAL SATISFACTION  
 VARIABLE(S) LISTED ON STUDY NUMBER 1, D1 HONESTY AND  
 D2 STYMOLE JOHNSON AFB

STATISTIC	VALUE	STATISTIC	VALUE
MEAN	0.6602	SUM OF SQUARES	1.2637
STANDARD DEVIATION	0.0072	MEAN SQUARE	0.7037
RESIDUAL	-0.00157		
	1.45652		

ANALYSIS OF VARIANCE OF REGRESSION  
 VARIABLE F100  
 F100 1.1225  
 RESIDUAL 1.117

ANALYSIS OF VARIANCE OF REGRESSION  
 VARIABLE D1  
 D1 1.1225  
 RESIDUAL 1.117

ANALYSIS OF VARIANCE OF REGRESSION  
 VARIABLE D2  
 D2 1.1225  
 RESIDUAL 1.117



COEFFICIENT OF CORRELATION  
 TEST VALUE = 0.997143 (CALC = 0.997197)  
 . . . . . MULTIPLE R SQUARE . . . . . VARIANCE RATIO  
 DEGREE OF FREEDOM . . . . . DEGREES OF FREEDOM . . . . . DEGREES OF FREEDOM  
 VARIANCE ESTIMATE OF SLOPE PARAMETER (S<sub>b</sub>) . . . . .

ANALYSIS OF VARIANCE OF MULTIPLE REGRESSION  
 SOURCE OF VARIANCE . . . . . SUM OF SQUARES . . . . . MEAN SQUARE  
 TOTAL . . . . . 2.10000 . . . . . 2.10000  
 REGRESSION . . . . . 1.98000 . . . . . 1.98000  
 RESIDUAL . . . . . 0.12000 . . . . . 0.12000

ANALYSIS OF VARIANCE OF MULTIPLE REGRESSION  
 SOURCE OF VARIANCE . . . . . SUM OF SQUARES . . . . . MEAN SQUARE  
 TOTAL . . . . . 2.10000 . . . . . 2.10000  
 REGRESSION . . . . . 1.98000 . . . . . 1.98000  
 RESIDUAL . . . . . 0.12000 . . . . . 0.12000

ANALYSIS OF VARIANCE OF MULTIPLE REGRESSION  
 SOURCE OF VARIANCE . . . . . SUM OF SQUARES . . . . . MEAN SQUARE  
 TOTAL . . . . . 2.10000 . . . . . 2.10000  
 REGRESSION . . . . . 1.98000 . . . . . 1.98000  
 RESIDUAL . . . . . 0.12000 . . . . . 0.12000

ANALYSIS OF VARIANCE OF MULTIPLE REGRESSION  
 SOURCE OF VARIANCE . . . . . SUM OF SQUARES . . . . . MEAN SQUARE  
 TOTAL . . . . . 2.10000 . . . . . 2.10000  
 REGRESSION . . . . . 1.98000 . . . . . 1.98000  
 RESIDUAL . . . . . 0.12000 . . . . . 0.12000

ANALYSIS OF VARIANCE  
 TEST STATISTIC (ESTIMATION DATE = 08/29/78)  
 .....

TEST STATISTIC (ESTIMATION DATE = 08/29/78) ..... VARIABLE LIST 1  
 REGRESSION LIST 1

TEST STATISTIC (ESTIMATION DATE = 08/29/78) ..... VARIABLE LIST 1  
 REGRESSION LIST 1

TEST STATISTIC (ESTIMATION DATE = 08/29/78) ..... VARIABLE LIST 1  
 REGRESSION LIST 1

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 REGRESSION LIST 1

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 REGRESSION LIST 1

TEST STATISTIC (ESTIMATION DATE = 08/29/78) ..... VARIABLE LIST 1  
 REGRESSION LIST 1

TEST STATISTIC (ESTIMATION DATE = 08/29/78) ..... VARIABLE LIST 1  
 REGRESSION LIST 1

ANALYSIS OF VARIANCE  
 TEST STATISTIC (CORRECTION CASE # CR/09/74)  
 . . . . . M U L T I P L E R E G R E S S I O N . . . . . V A R I A N C E L E S T  
 . . . . . R E G R E S S I O N . . . . . R E G R E S S I O N . . . . . R E G R E S S I O N . . . . . R E G R E S S I O N . . . . .  
 . . . . . O P E R A T I O N A L . . . . . O P E R A T I O N A L . . . . . O P E R A T I O N A L . . . . . O P E R A T I O N A L . . . . .  
 V A R I A N C E L E S T . . . . . M O D E L I N G . . . . . M O D E L I N G . . . . . M O D E L I N G . . . . . M O D E L I N G . . . . .  
 . . . . . S T A N D A R D E R R O R . . . . . S T A N D A R D E R R O R . . . . . S T A N D A R D E R R O R . . . . . S T A N D A R D E R R O R . . . . .

ANALYSIS OF VARIANCE	SUM OF SQUARES	DF	SUM OF SQUARES	DF	MEAN SQUARE	F
REGRESSION	0.12785	2	9.27432	2	4.63716	3.03005
RESIDUAL	0.19030	377	1258712	377	3338.785	
TOTAL	0.31815	379				
ADJUSTED R SQUARED	0.07134					
STANDARD ERROR	1.25981					

----- V A R I A B L E S I N T H E E Q U A T I O N -----

VARIABLE	BETA IF	PARTIAL	EDWARDS	F
1	0.41187	0.41187	0.32405	18.041
2	0.67265	0.23145	0.06473	3.737
3	1.02827	0.32312	0.10008	5.575

----- V A R I A B L E S N O T I N T H E E Q U A T I O N -----

----- V A R I A B L E S I N T H E E Q U A T I O N -----

VARIABLE	BETA IN	PARTIAL	EDWARDS	F
1	0.23058	0.00782	0.00063	0.001
2	0.21497	0.05433	0.00201	1.110

----- V A R I A B L E S N O T I N T H E E Q U A T I O N -----

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ANALYSIS OF VARIANCE  
 FILE: 104877 (REGRESSION DATA 07/09/78)  
 \*\*\*\*\* MULTIPLE REGRESSION \*\*\*\*\* VARIABLE LIST \*  
 DEPENDENT VARIABLE: FMS2 ORGANIZATIONAL REGRESSION LIST \*  
 VARIABLE(s) ENTERED ON STEP NUMBER 3: 02842  
 04132

MULTIPLE R 0.43804 MEAN SQUARE F 17.56485  
 F SQUARE 1.75017  
 ADJUSTED R SQUARE 0.17933 SUM OF SQUARES 23.13503  
 STANDARD ERROR 1.14769 RESIDUAL 1,31720

VARIABLES IN THE EQUATION			VARIABLES NOT IN THE EQUATION		
VARIABLE	BETA	STD ERROR B	VARIABLE	BETA IN	PARTIAL TOLERANCE
L1	-0.50232	0.16104			
L2	-0.92480	0.26523			
F12	0.33015	0.28882			
02842	0.26266	0.34807			
04132	0.16647	0.28001			
REGRESSION					0.477
RESIDUAL					2.132
					8.344
					2.132
					1.043

ALL VARIABLES ARE IN THE EQUATION



ANALYSIS OF VARIANCE  
FILE NAME: STATISTICS DATE: 08/08/75  
MULTIPLE REGRESSION  
DEPENDENT VARIABLE: EP2  
GROUP CLIMATE-COMMUNICATIONS AND REPORT  
VARIABLES ENTERED ON STEP NUMBER 1: F2 GROUP CLIMATE-

ANALYSIS OF VARIANCE		SUM OF SQUARES		MEAN SQUARE	
REGRESSION	112.764	140.0007	140.0007	112.75431	F
RESIDUAL	0.47933	469.6307	1.24243		
TOTAL					

..... VARIABLES IN THE EQUATION .....

VARIABLE	BETA	STD ERROR B	F	PARTIAL CORRELATION	T
1	0.47933	0.45872	112.764	-0.64274	0.0777
2	1.53861	0.47933	112.764	0.64274	0.0777
(CONSTANT)	7.04078			0.04114	0.0009

..... VARIABLES NOT IN THE EQUATION .....

VARIABLE	BETA IN	PARTIAL CORRELATION	T
1	-0.00750	-0.00777	0.0000
2	0.85346	0.04114	0.0009

..... VARIABLES ENTERED ON STEP NUMBER 2: M1 SEYMOUR JOHNSON AFD

ANALYSIS OF VARIANCE		SUM OF SQUARES		MEAN SQUARE	
REGRESSION	112.764	141.8484	141.8484	112.75431	F
RESIDUAL	0.47933	467.8774	1.24243		
TOTAL					

..... VARIABLES IN THE EQUATION .....

VARIABLE	BETA	STD ERROR B	F	PARTIAL CORRELATION	T
1	0.47933	0.45872	112.764	-0.64274	0.0777
2	1.53861	0.47933	112.764	0.64274	0.0777
(CONSTANT)	7.04078			0.04114	0.0009

..... VARIABLES NOT IN THE EQUATION .....

ANALYSIS OF VARIANCE  
 TITLE: REGRESSION DATA (BAP/4724)  
 ANALYSIS OF VARIANCE  
 SOURCE OF VARIANCE: SS, DF, MEAN SQUARE, F, P, S, D, E, S, I, M, O, . . . . .  
 REGRESSION: 143.84192  
 RESIDUAL: 392.17281  
 TOTAL: 536.01473  
 MEAN SQUARE: 143.84192 / 378 = .37998  
 RESIDUAL: 392.17281 / 378 = 1.03485  
 TOTAL: 536.01473 / 756 = .70783  
 F: 3.67255  
 P: 0.06285  
 S: 0.22185  
 D: 0.22185  
 E: 0.22185  
 S: 0.22185  
 I: 0.22185  
 M: 0.22185  
 O: 0.22185

VARIABLES IN THE EQUATION  
 VARIABLE: BETA IN PARTIAL REGRESSION  
 VARIANCE: 0.07424  
 MEAN SQUARE: 0.07424  
 F: 0.19007  
 P: 0.66870  
 S: 0.66870  
 D: 0.66870  
 E: 0.66870  
 S: 0.66870  
 I: 0.66870  
 M: 0.66870  
 O: 0.66870

ANALYSIS OF VARIANCE  
 SOURCE OF VARIANCE: SS, DF, MEAN SQUARE, F, P, S, D, E, S, I, M, O, . . . . .  
 REGRESSION: 143.84192  
 RESIDUAL: 392.17281  
 TOTAL: 536.01473  
 MEAN SQUARE: 143.84192 / 378 = .37998  
 RESIDUAL: 392.17281 / 378 = 1.03485  
 TOTAL: 536.01473 / 756 = .70783  
 F: 3.67255  
 P: 0.06285  
 S: 0.22185  
 D: 0.22185  
 E: 0.22185  
 S: 0.22185  
 I: 0.22185  
 M: 0.22185  
 O: 0.22185

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ANALYSIS OF PERFORMANCE  
 FILE NAME: OPERATIONAL DATE: 04/20/72  
 . . . . . MULTIPLE REGRESSION . . . . . VARIANCE LIST 1  
 PROPOSED VARIABLES: FPS COMMITMENT  
 VARIABLES ENTERED BY STEP NUMBER 1. . . . . COMMITMENT AND COMPETITION

MULTIPLE R 0.21284  
 F SCORE 1.02842  
 ADJUSTED R SQUARE 0.07187  
 STANDARD ERROR 1.54728

ANALYSIS OF VARIANCE OF  
 REGRESSION 3.  
 RESIDUAL 376.  
 SUM OF SQUARES 158.71457  
 MEAN SQUARE 19.74164  
 41.43084

VARIABLES IN THE EQUATION  
 VARIABLE D1 D2  
 COEFFICIENT 0.27284 0.27284  
 STD ERROR 0.81042 0.81042

VARIABLES ENTERED BY STEP NUMBER 2. . . . . UNDETERMINED  
 SEYMOUR JOHNSON AFD  
 MULTIPLE R 0.27184  
 F SCORE 0.07552  
 ADJUSTED R SQUARE 0.06814  
 STANDARD ERROR 0.64932

VARIABLES IN THE EQUATION  
 VARIABLE D1 D2  
 COEFFICIENT 0.27211 0.27247  
 STD ERROR 0.84329 0.84329

ALL VARIABLES ARE IN THE EQUATION

ANALYSIS OF COVARIANCE  
 TITLE: MATHS (REGRESSION RATE & 1949/70)  
 MULTIPLE REGRESSION  
 DEPENDENT VARIABLE: EPA SKILLS  
 INDEPENDENT VARIABLES: EPA SKILLS

ANALYSIS OF VARIANCE  
 ANALYSIS OF VARIANCE  
 REGRESSION  
 RESIDUAL

VARIABLES IN THE EQUATION  
 VARIABLE NOT IN THE EQUATION

VARIABLES ENTERED BY STEP NUMBER  
 STEP 01: HOPSTEAD ICM  
 STEP 02: SEYMOUR JOHNSON ICM

VARIABLES IN THE EQUATION  
 VARIABLE NOT IN THE EQUATION

VARIABLES NOT IN THE EQUATION

THE YEAR TO COMPLETION DATE IS 12/31/78  
 ANALYSIS OF VARIATION OF MULTIPLE REGRESSIONS (M R) IN THE YEAR TO COMPLETION DATE IS  
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VEGETATION DATA (CONTINUED)  
SITE: MOUNTAIN SPRINGS (METS/28)  
ANALYSIS OF VARIANCE OF VEGETATION DATA IN THE PLOT

Table with columns: VARIABLE, MEAN SCORE, VARIATION, etc. Includes rows for VARIATION, MEAN SCORE, etc.

ANALYSIS OF VARIANCE OF VEGETATION DATA IN THE PLOT (CONTINUED)  
VARIABLE, MEAN SCORE, VARIATION, etc.

VEGETATION DATA (CONTINUED)  
ANALYSIS OF VARIANCE OF VEGETATION DATA IN THE PLOT

Table with columns: VARIABLE, MEAN SCORE, VARIATION, etc. Includes rows for VARIATION, MEAN SCORE, etc.

VEGETATION DATA (CONTINUED)  
ANALYSIS OF VARIANCE OF VEGETATION DATA IN THE PLOT

ANALYSIS OF COVARIANCE  
 TEST NUMBER REGRESSION TABLE 08/20/72A  
 . . . . . MULTIPLE REGRESSION . . . . . VARIABLE LIST 1  
 . . . . . INTERGROUP COOPERATION . . . . . REGRESSION LIST 1

VARIABLES ENTERED ON STEP NUMBER 1. . . . . INTERGROUP COOPERATION  
 MULTIPLE R . . . . . 0.35803  
 R SQUARE . . . . . 0.12829  
 ADJUSTED R SQUARE . . . . . 0.12298  
 STANDARD ERROR . . . . . 1.28685

ANALYSIS OF VARIANCE OF SUM OF SQUARES  
 1. REGRESSION 54.621  
 2. RESIDUAL 627.08450  
 378. MEAN SQUARES 1.66119  
 F 51.0048

VARIABLES IN THE EQUATION . . . . . VARIABLES NOT IN THE EQUATION . . . . .  
 VARIABLE 0 BETA STD ERROR B F  
 01 0.35798 0.04493 54.621  
 02 2.02939 0.34303

VARIABLES ENTERED ON STEP NUMBER 2. . . . . HOMESTEAD AFR  
 SETBACK JOURNAL AFR  
 MULTIPLE R . . . . . 0.35517  
 R SQUARE . . . . . 0.12686  
 ADJUSTED R SQUARE . . . . . 0.11919  
 STANDARD ERROR . . . . . 1.29104

VARIABLES IN THE EQUATION . . . . . VARIABLES NOT IN THE EQUATION . . . . .  
 VARIABLE 0 BETA STD ERROR B F  
 01 0.35059 0.22252 53.008  
 02 -0.14458 0.10826 11.588  
 03 -0.24178 -0.05153 11.7818  
 04 2.08159 0.6336

ANALYSIS OF COMPLIANCE  
FILE NAME CREATION DATE 88/08/78  
DEPENDENT VARIABLE: (D1) GENERAL SATISFACTION  
VARIABLE ENTERED ON STEP NUMBER 1.. F10 GENERAL SATISFACTION

MULTIPLE R 0.55283  
F SQUARE 0.30657  
ADJUSTED SQUARE 0.30333  
STANDARD ERROR 1.32233

ANALYSIS OF VARIANCE OF REGRESSION RESIDUAL  
SUM OF SQUARES 204.23048  
MEAN SQUARE 204.23048  
DEGREES OF FREEDOM 661.14238  
TOTAL 174987

VARIABLE F BETA STD ERROR D F  
(CONSTANT) 0.54855 0.55283 145.934  
01 0.81715  
02 0.81714 0.12024 0.98574  
03 0.81714 0.12024 0.98574

VARIABLES ENTERED ON STEP NUMBER 2.. 01 02  
HOMESTEAD AFH  
SEYMOUR JOHNSON AFB

MULTIPLE R 0.55261  
F SQUARE 0.30634  
ADJUSTED SQUARE 0.29984  
STANDARD ERROR 1.32274

ANALYSIS OF VARIANCE OF REGRESSION RESIDUAL  
SUM OF SQUARES 204.53442  
MEAN SQUARE 204.53442  
DEGREES OF FREEDOM 660.55384

VARIABLE F BETA STD ERROR D F  
(CONSTANT) 0.54856 0.55170 145.900  
01 0.81715 0.12018 0.98574  
02 0.81715 0.12018 0.98574  
03 0.81715 0.12018 0.98574

VARIABLES ENTERED ON STEP NUMBER 3.. 01 02 03  
HOMESTEAD AFH  
SEYMOUR JOHNSON AFB  
SULLY AFB



SUMMARY OF REGRESSION  
 TIME = 0.45001 + 0.00000 \* BETA 1 + 0.00000 \* BETA 2  
 STANDARD ERROR = 0.00000  
 ANALYSIS OF VARIANCE

SOURCE	SS	DF	MS	F	PROB > F
REGRESSION	9.43487	2	4.71743	33.267	0.00006
SUM OF SQUARES	9.43487	2	4.71743		
RESIDUAL	1.45001	378	0.00384		
TOTAL	10.88488	380			

VARIABLES IN THE EQUATION  
 BETA 1  
 BETA 2

VARIABLE	DATA IN	SUM OF SQUARES	PROB > F
BETA 1	0.00000	0.00000	0.99999
BETA 2	0.00000	0.00000	0.99999

VARIABLES NOT IN THE EQUATION  
 BETA 3  
 BETA 4



SELECTED BIBLIOGRAPHY

#### A. REFERENCES CITED

- AFR 66-5 Production Oriented Maintenance Organization (POMO).  
U.S. Department of the Air Force. Washington, D.C.:  
Government Printing Office, 1977.
- Aquilano, Nicholas J. "Multiskilled Work Teams: Productivity Benefits," California Management Review, Vol. 19, No. 4 (Summer 1977), pp. 17-22.
- Argyris, Chris. "Personality vs. Organization," Organizational Dynamics, Vol. 3, No. 2 (August 1974), pp. 2-17.
- Baird, Lloyd S. "Relationship of Performance to Satisfaction in Stimulating and Non-stimulating Jobs," Journal of Applied Psychology, Vol. 61, No. 6 (1976), pp. 721-727.
- Beu, Major Norman J. and Major Richard C. Nichols, USAF. "More Maintenance in OMS." Unpublished research report No. 0205-77, Air Command and Staff College, Maxwell AFB AL, 1977.
- Bucklow, Maxine. "A New Role for the Work Group," in Jerry L. Gray and Frederick A. Starke, eds., Readings in Organizational Behavior: Concepts and Applications. Columbus, Ohio: Charles E. Merrill Publishing Company, 1977.
- Carlisle, Howard M. "A Contingency Approach to Decentralization," Advanced Management Journal, Vol. 39, No. 3 (July 1974), pp. 9-18.
- Cartwright, Dorwin. "Achieving Change in People: Some Applications of Group Dynamics Theory," in Donald F. Porter, Philip B. Applewhite, and Michael J. Misshauk, Studies in Organizational Behavior and Management. 2d ed., Scranton, Penn: International Textbook Company, 1971.
- Chaney, Frederick B. and Kenneth S. Teel. "Participative Management - A Practical Experience," Personnel, Vol. 49, No. 6 (November-December 1972), pp. 8-19.
- Craven, W. F. and J. L. Cate. The Army Air Forces in World War II, Vol. II: Men and Planes. Chicago: The University of Chicago Press, 1955.

- Cummings, Thomas G. and Walter H. Griggs. "Worker Reactions to Autonomous Work Groups: Conditions for Functioning, Differential Effects, and Individual Differences," Organization and Administrative Sciences, Vol. 7, No. 4 (Winter 1976/77), pp. 87-100.
- \_\_\_\_\_, Edmond S. Molloy, and Roy H. Glen. "Intervention Strategies for Improving Productivity, and the Quality of Work Life," Organizational Dynamics, Vol. 4, No. 1 (Summer 1975), pp. 52-68.
- Cummings, L. L., Donald P. Schwab, and Marc Rosen. "Performance and Knowledge of Results as Determinants of Goal Setting," Journal of Applied Psychology, Vol. 55, No. 6 (1971), pp. 526-530.
- Davis, Louis E. "Readying the Unready: Post-industrial Job," in John W. Newstrom, William E. Reif, Robert M. Monczka, A Contingency Approach to Management: Readings. New York: McGraw-Hill Book Company, 1975.
- Dettleback, W. W. and P. Kraft. "Organization Change Through Job Enrichment," Training and Development Journal, Vol. 25, No. 8 (1971), pp. 2-6.
- Driscoll, James W. "Trust and Participation in Organizational Decision Making as Predictors of Satisfaction," Academy of Management Journal, Vol. 21, No. 1 (1978), pp. 44-56.
- Edwards, Allen L. Experimental Design In Psychological Research. 3d ed. New York: Holt, Rinehart, and Winston, Inc., 1968.
- Egerton, Captain Robert D., Captain Ebert E. Muterspaw, and Captain Crispin M. Wood. "Main-man-X Dynamic Decision Making For Base Maintenance Managers Using AFM 66-1 Data." Unpublished master's thesis. SLSR 21-63, AFIT/SL, Wright-Patterson AFB, Ohio, August 1963.
- Emery, Fred E. "Bureaucracy and Beyond," in H. Kirk Downey, Don Hellriegel, and John W. Slocum Jr., Organizational Behavior - A Reader. New York: West Publishing Company, 1977.
- Ford, Robert N. "Job Enrichment Lessons from AT&T," Harvard Business Review, Vol. 51, (January-February 1973), pp. 96-106.

- Fryer, Michael A. and Thomas W. Zimmerer. "The Work Environment: Key to Greater Productivity?" The Personnel Administrator, Vol. 20, No. 1 (1975), pp. 38-42.
- Gurney, Gene. Journey of the Giants. New York: Van Nostrand Press, 1961.
- Hackman, J. Richard, and Edward E. Lawler III. "Employee Reactions to Job Characteristics," Journal of Applied Psychology Monograph, Vol. 55, No. 3 (June 1971), pp. 259-285.
- Halsell, Major Laman H., USAF. "Alternative Aircraft Management." Unpublished research report No. 1035-77, Air Command and Staff College, Maxwell AFB, AL. 1977.
- Hamner, W. Clay. "Worker Motivation Programs: Importance of Climate, Structure and Performance Consequences," in W. Clay Hamner and Frank L. Schmidt, Contemporary Problems in Personnel. Chicago: St. Clair Press, 1974.
- Haynes, Marion E. "Delegation: Key to Involvement," Personnel Journal, Vol. 53, No. 6 (June 1974), pp. 454-456.
- Herzberg, Frederick I. and Edmund A. Rafalko. "Efficiency in the Military: Cutting Costs with Orthodox Job Enrichment," Personnel, Vol. 52, No. 6 (November-December 1975), pp. 38-48.
- Horstman, Lieutenant Donald M., USN, and Major John J. Kotzun, USAF. "The Impact of Growth and Social Needs on the Job Enrichment Process - A Laboratory Experiment." Unpublished master's thesis. LSSR 9-77B, AFIT/LSCR, Wright-Patterson AFB, OH, September 1977.
- House, William C. "Effects of Group Cohesiveness on Organization Performance," in D. E. McFarland, ed., Personnel Management. Middlesex, England: Penguin Books Ltd., 1971.
- Ivancevich, Jim, and J. H. Donnelly. "Relationship of Organizational Structure to Job Satisfaction, Anxiety-Stress, and Performance," Administrative Science Quarterly. Vol. 20 (1975), pp. 272-280.
- Janson, R. "Job Enrichment in the Modern Office," in J. R. Mahler, ed., New Perspectives in Job Enrichment. New York: VanNostrand, Reinhold, 1971, pp. 91-112.

- Katzell, Raymond A. and Daniel Yankelovich. "Improving Productivity and Job Satisfaction," Organizational Dynamics, Vol. 4, No. 1 (Summer 1975), pp. 69-80.
- Kim, Jay S. and W. Clay Hammer. "Effect of Performance Feedback and Goal Setting on Productivity and Satisfaction in an Organizational Setting," Journal of Applied Psychology, Vol. 61, No. 1 (1976), pp. 48-57.
- Korman, Abraham K. Organizational Behavior. Englewood Cliffs NJ: Prentice-Hall, Inc., 1977.
- Latham, Gary P. and Sydney B. Kinne III. "Improving Job Performance Through Training In Goal Setting," Journal of Applied Psychology, Vol. 59, No. 2 (1974), pp. 181-191.
- Lawler, Edward E. III. "Job Design and Employer Motivation," in Victor H. Vroom and Edward L. Deci, eds., Management and Motivation. Middlesex, England: Penguin Books Ltd., 1972.
- Leedy, Paul D. Practical Research: Planning and Design. New York: MacMillan.
- Levine, Edward L. "Problems of Organizational Control In Microcosms: Group Performance and Group Member Satisfaction as a Function of Differences In Control Structure," Journal of Applied Psychology, Vol. 58, No. 2 (1973), pp. 186-196.
- Maher, J. R. and W. B. Overbaugh. "Better Inspection Performance Through Job Enrichment," in J. R. Maher, ed., New Perspectives in Job Enrichment. New York: Van Nostrand, Reinhold, 1971, pp. 79-89.
- Mummers, George E., Jr. "Another Look at Group Size, Group Problem Solving, and Member Consensus," Academy of Management Journal, Vol. 18, No. 4 (December 1975), pp. 715-724.
- McNulty, L. A. "Job Enrichment: How to Make it Work," Supervisory Management, Vol. 18, No. 9 (1973), pp. 7-15.
- Monezka, Robert M. and William E. Reif. "A Contingency Approach to Job Enrichment Design," in John W. Newstrom, William E. Reif, and Robert M. Monezka, A Contingency Approach to Management: Readings. New York: McGraw-Hill Book Company, 1975.

- Nelson, Major General William R. "POMO A New Concept," Aerospace Safety, March, 1977, pp. 2-4.
- Neter, John, William Wasserman and J. Whitmore. Fundamental Statistics for Business and Economics. 4th ed. Boston: Allyn and Bacon, Inc., 1972.
- Nie, Norman H. and Others. Statistical Package for the Social Sciences. 2nd ed. New York: McGraw-Hill, Inc., 1975.
- Randall, R. "Job Enrichment Savings at Travelers," Management Accounting, 1973 (January), pp. 68-69, 72.
- Reif, W. E. and P. P. Schoderbek. "Job Enlargement: Antidote to Apathy," in D. E. McFarland, Personnel Management. Middlesex, England: Penguin Books Lts., 1971.
- Reimann, Bernard C. "Organizational Effectiveness and Management's Public Values: A Canonical Analysis," Academy of Management Journal, Vol. 18, No. 2 (1975), pp. 224-241.
- Ross, Joel E. and Robert G. Murdick. "People, Productivity, and Organizational Structure," Personnel, Vol. 50, No. 5 (September-October 1973), pp. 8-18.
- Rousseau, Denise M. "Technological Differences in Job Characteristics, Employee Satisfaction, and Motivation: A Synthesis of Job Design Research and Sociotechnical System Theory," Organizational Behavior and Human Performance, Vol. 19, (1977), pp. 18-42.
- Scanlan, Burt K. "Determinants of Job Satisfaction and Productivity," Personnel Journal, Vol. 55, No. 1 (January 1976), pp. 12-14.
- Shepard, Jon M. "Functional Specialization, Alienation, and Job Satisfaction," Industrial and Labor Relations, Vol. 23, No. 2 (January 1970), pp. 207-219.
- Sexton, William P. and Yu-Chi-Chang. "Value Orientation as a Mediator of Job Structure, Satisfaction, and Productivity: An Empiric Investigation and Contingency Model," Organization and Administrative Sciences, Vol. 7, No. 4 (Winter 1976/77), pp. 73-86.
- Srivastva, Suresh and Paul F. Salipante, Jr. "Autonomy in Work," Organization and Administrative Science, Vol. 5, No. 1-2 (Spring-Summer 1976), pp. 49-60.



Stone, Eugene F. "The Moderating Effect of Work-Related Values on the Job Scope - Job Satisfaction Relationship," Organizational Behavior and Human Performance, Vol. 15, (1976), pp. 147-167.

Stone, Thomas H. "Effects of Mode of Organization and Feedback Level on Creative Task Groups," Journal of Applied Psychology, Vol. 55, No. 4 (1971), pp. 324-330.

Umstot, Lieutenant Colonel Denis D., USAF. Assistant Professor of Management, School of Systems and Logistics, AFIT/LSGR. Letter, subject: Research on the Effects of POMO to HQ TAC/LGM, 1 May 1977.

\_\_\_\_\_, Cecil H. Bell, Jr., and Terence R. Mitchell. "Effects of Job Enrichment and Task Goals on Satisfaction and Productivity: Implications for Job Design," Journal of Applied Psychology, Vol. 61, No. 4 (1976), pp. 379-394.