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Contract No. MDA903-77-C-0039
June, 1979

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COMPARATIVE STUDIES OF ORGANIZATIONAL FACTORS IN MILITARY MAINTENANCE

FINAL REPORT

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Prepared For:

CYBERNETICS TECHNOLOGY OFFICE
Defense Advanced Research Projects Agency
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This report describes the results of the second year effort of a two-year research program. The program was directed toward improving the capability of U.S. Army Aviation Maintenance Operations. The objectives of the overall program were to explore those organizational factors, emphasizing incentive structures, that influence aviation maintenance performance effectiveness and efficiency. The current effort was directed toward performing a demonstration study based on one of the initial year's recommendations,

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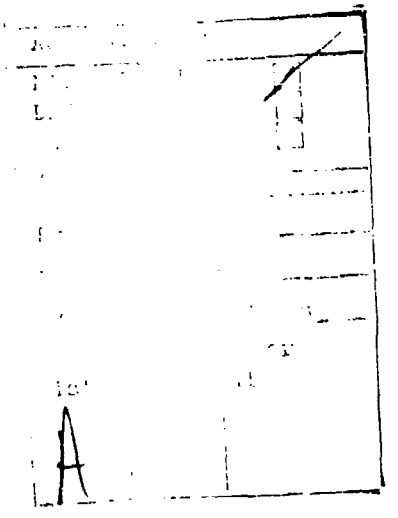
which included the finding that it may be more profitable to reduce existing disincentives rather than produce additional incentives. One such disincentive was that of inefficient manpower scheduling for non-maintenance activities. A new scheduling system was experimentally tested within a operational U.S. Army Aviation Maintenance installation using an Organization Development intervention strategy. This system was a work pool approach and involved utilizing a small segment of the work force to perform taskings on a team rotational basis. Successful results were obtained in two major areas: (1) the reduction in primary MOS job interrruptions; and (2) increased manpower control for work station supervisors.



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1. INTRODUCTION

1.1 Overview

This report presents the results of the second year's effort in a research program directed towards improving the maintenance capability in U.S. military maintenance systems. The intent of the program was to explore those organizational factors, emphasizing incentive structures that influenced maintenance effectiveness and efficiency, which might be responsible for the high costs of the military maintenance operations. The technical approach combined both descriptive and analytical methodologies. In the first year of study the focus was on a comparative examination of U.S. military and civilian groups performing maintenance on equivalent and representative light helicopter systems. The research goal of the first year's effort was to utilize the obtained data to generate recommendations for improving the effectiveness and efficiency of aviation maintenance through adding additional incentives or reducing existing disincentives. The research goal for the second year was to select one or more of the first year's recommendations that was feasible to test within the confines of contract activity, convert the recommendation(s) into a testable hypothesis and, perform a demonstration study using an intervention strategy on a operational U.S. Army aviation installation.

1.2 Background

1.2.1 Problem Statement. The role of the Department of Defense is to provide for the national security of the United States. The activities and costs required to maintain the national security have changed dramatically since the days when only a relatively small military force existed and very little equipment was available in the military inventory. For example, in the 1930's, the top speed of the nearly 1000 aircraft in the

Army Air Corps' inventory was about 200 miles per hour. A relaxed attitude prevailed among defense planners, and it was generally assumed that a year or two would be available to the United States to mobilize both people and industry to meet any hostile challenge.

Drastic changes, however, have occurred within the world situation over the intervening decades. A great many more people are now involved in the defense of the Nation and in the maintenance of an all-services inventory of thousands of aircraft, missiles, and other systems. At the same time, the quantity and sophistication of military weapons of other nations has also increased, and the United States is no longer isolated from direct or surprise attack. In the environment of today's world, the time available for mobilization of military forces has been reduced from years and months to perhaps as little as a few hours. As we cannot delay mobilization until after hostilities have begun, it is necessary for military forces to maintain a constant state of readiness and to be capable of responding rapidly to any situation. The multitude of situations into which the military can be called, coupled with the mix of weapons and hardware required to counter those situations, makes the success of any modern day military mission dependent on the continued readiness of military people and equipment. Military equipment readiness is thus a fundamental element in the defense of the Nation. The role of maintenance forces within the Department of Defense, accordingly is to sustain equipment in a state of operational readiness, consistent with the demands of the operating forces, and to do this at the lowest possible costs.

1.2.2 Costs of Maintenance. Maintenance costs have soared in recent years. Recent studies (Smith et al., 1970; Turke, 1977) estimate the costs of maintenance to be from 20 to 30 percent of the DoD budget. Unfortunately these cost figures only portray the overall costs of maintenance. Currently, there is no system in the military services which accurately computes

separate costs of support systems and subsystems. A general Accounting Office audit report (1971) revealed the cost accounting practices varied so widely among the services and within services that no meaningful comparisons of activities performing similar work could be made. The apparent reason for this is that there is no single appropriations agency that totally finances maintenance functions. Funds for maintenance come from such agencies as military personnel, operations and maintenance, procurement, and military construction. Many "within house" funds such as manpower, supply, transportations and so forth ultimately end up being used for maintenance. Nevertheless, a low estimate places the cost of depot and unit level weapon system and equipment maintenance at $18 to $20 billion with approximately $6.5 billion of that going to depot. The problem with specifying the cost of maintenance below the depot level is that manpower and other resources utilized for maintenance at the unit level are also utilized for other tasks associated with other military duties. On the one hand, high levels of funding appears necessary in order to sustain a high quality of maintenance and in turn, a high level of equipment readiness. On the other hand, maintenance costs must be controlled to free funds for the modernization of defense capabilities. New, complex, technological weapon systems generate added costs associated with personnel selection, placement, and training. Other cost factors associated with complexity are the high cost of parts and the increased maintenance man-hours required to maintain equipment readiness. It is usual to expect that the maintenance costs of a weapon system in many cases exceed those of acquiring the system initially. The acquisition cost, although given more publicity, is often not the major cost of a system. The cost of the long term commitment cannot be accurately known at the outset. It thus becomes essential to devise procedures for controlling costs over the equipment's entire life cycle. As the costs of maintenance have grown in both magnitude and importance, the need for control has been specifically recognized. This has resulted in the placement of the Office of Maintenance Policy under the directorship of the Deputy Assistant Secretary of Defense (Turke, 1977).

1.2.3 Improving Maintenance Effectiveness. There are a number of active ongoing programs to improve maintenance management. These programs are generally designed to increase readiness and decrease costs by using logistics support planning designed to control downstream maintenance workloads and costs.

When a new weapon system enters initial production 80% or more of its future maintenance requirements have been set as a consequence of design. Potential maintenance can be reduced if the equipment is designed to ensure high reliability and maintainability. Logistics support planning is a promising long term solution to reducing maintenance costs. However, logistic support planning does not solve the immediate problems of military maintenance operations. The DoD currently has a large inventory of equipment varying in age, type, technology and degree of complexity. What is needed is a method for improving effectiveness and efficiency in the current operational environment.

In addition to being a large proportion of the military's day-to-day activities, it is well recognized that current systems of military maintenance fall far short of optimum performance. Even where maintenance is effective, in the sense of keeping equipment operationally ready, it is inefficient in terms of personnel, material, and time. To many, it seems that the rapid growth in equipment complexity has outstripped the ability of the system to prepare and orient maintenance personnel adequately. As a result, virtually all recent attempts at improving maintenance have focused on two areas: (1) improving technician skills, primarily through training, and (2) providing on-the-job aids, primarily manuals and other technical devices (King and Duva, 1975). Research and development in these areas has emphasized new types of equipment, and there has been only a limited effect on maintenance system performance (Bond, 1970).

A major reason for the previous lack of payoff in maintenance research and development is a relative neglect of important organizational factors. For instance, Foley (1975) has pointed out that "methods used to select, train, and promote maintenance personnel in themselves contribute to inefficient maintenance." Attention to organizational effectiveness, which includes such factors as management policies, incentive structures, and inter-personnel relations, in addition to training programs and task design, has caused significant improvement in other organizational contexts (Zawacki, 1974). Attention to organizational policies and procedures may be a highly promising means of improving the cost-effectiveness of military maintenance.

Improvements in system effectiveness due to organizational modifications have been previously demonstrated in a large number of cases. For example, Vroom (1964) and Lawler (1971) provide extensive reviews of the literature showing that when organizational policies, incentive systems, and work situations are structured to make reward (both intrinsic and extrinsic) contingent upon performance, increases in productivity, job attendance and motivation result. Similarly, Porter and Lawler (1965) reviewed much of the then current literature regarding the effects of organizational structure on worker attitudes and performance. Variables such as span of control, work shop size, and tall or flat organizational structure, were whoen to be related to productivity, job satisfaction, absenteeism, and turnover.

In the area of organizational development, Hitchcock and Sanders (1974) found strong relationships between various dimensions of organizational climate/management practices and the criterion of accidents among munition workers. Goal setting, as an organizational practice, has also been shown to improve job performance (Latham and Kinne, 1974). Lawler (1969) found evidence of increased productivity in 6 out of 10 studies which redesigned

jobs to increase intrinsic motivation. Ford (1969) reported a 27% reduction in turnover through such efforts; and Bowers (1973), studying 23 civilian organizations, demonstrated the effectiveness of organizational development in improving decision making performance. The research evidence, then, overwhelmingly supports the contention that organizational policies and practices have direct and significant effects on personnel performance and organizational effectiveness.

1.3 Objectives

The principal objective of this study was to identify organizational policies, practices and procedures that act as incentives and/or disincentives for providing cost-effective maintenance in the military. We have taken a broad view of incentives and disincentives and included system characteristics, policies, and procedures which appeared to impact directly on the work motivation of the maintenance personnel. The focus has been upon those organizational factors which affect the work unit personnel and immediate supervisors who control maintenance on a day-to-day basis. In this context, we have emphasized that performance can be improved both by introducing and increasing incentives and by removing and decreasing disincentives.

Maintenance organizations are complex structures encompassing a multitude of factors which can potentially affect the overall effectiveness of the organization. A need existed, therefore, to structure the critical organization and interpersonal factors in a coherent fashion to facilitate measurement and analysis. A model was developed for this purpose. An organization's effectiveness is seen as direct consequence of the behavior and attitudes of the individual personnel. Organizational processes, demands, constraints, incentives, philosophies, etc. impact on organizational effectiveness only as they effect the performance of the individual

worker. The central focus of the model is, therefore, the primary work group composed of supervisor and maintenance personnel. The concept of "focal person" is introduced in the model to denote an individual person. Each member of the work group is, in essence, a focal person.

The model proposed was not intended to be all inclusive, but served to direct attention to important variables which required assessment to document comparisons between military and non-military maintenance systems. The model is not unique to maintenance organizations but is applicable to most any organization. The specific factors might change and work importance might vary but the basic model is generalizable. It is this generalizability that made it attractive for the comparison of military and non-military organizations. A model specific to military organization would have made meaningful comparisons with non-military organizations difficult and tenuous.

The basic model is illustrated in Figure 1-1. The model is divided into three main parts; organizational inputs, work unit, and organizational outputs. Organizational inputs to the work group are seen as being influended by contextual factors outside the organization. Within the work group unit the supervisor and co-workers influence the focal person. Organizational inputs are seen as influencing each member of the work group directly as well as through interactions. Central to the model is the importance placed on the work group members' subjective perceptions of the organization and themselves. These perceptions directly impact organizational outputs. For a more detailed description of the variables making up the model refer to Drake, Sanders, Crooks, and Weltman (1977).

The model is closed loop in that information concerning the organizational outputs are fed back and effect changes in the organizational inputs and the work unit. The system, itself, is an open system in that it affects, and is affected by, the outside environment.

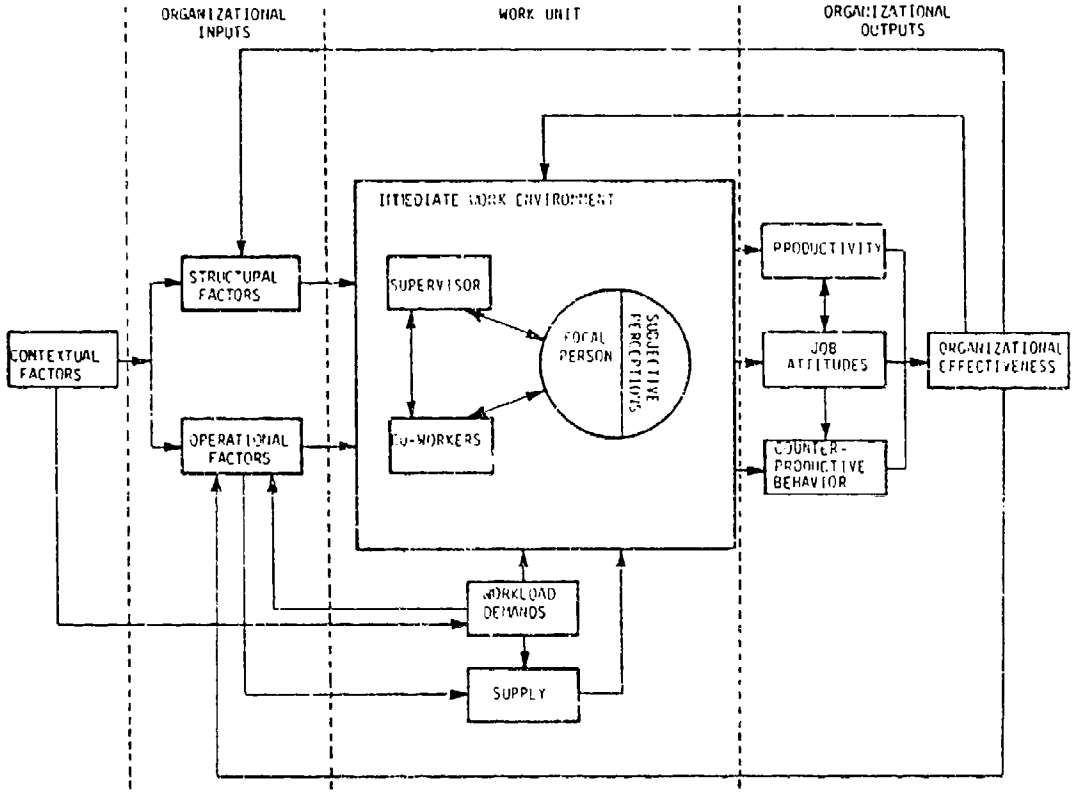


FIGURE 1-1.
MODEL OF INCENTIVES AND ORGANIZATIONAL EFFECTIVENESS

The program objective can be divided into the following specific subobjectives:

First Year of Study:

(1) Survey and categorize the critical organizational and interpersonal factors which control the ability of a military maintenance system to deliver effective and efficient maintenance.

(2) Investigate a selected number of military and civilian groups maintaining an equivalent high technology system to acquire, by questionnaire and interview, comparative field data on maintenance organizational goals, structure and function, support structure, incentives, and personnel attitudes, as well as the cost effectiveness of maintenance.

(3) Organize and analyze the field data so as to permit (a) direct comparison among U.S. systems, and (b) identification of the key organizational factors contributing to good and bad system performance.

(4) Based on the results and conclusions, formulate guidelines and specific recommendations for the improvement of maintenance system performance.

Second Year of Study:

(1) Based on the first year's recommendations perform an experimental study demonstrating the effect of implementing recommendation in an operational military maintenance environment.

1.4 Technical Approach: First Year's Program

The approach of the study was to compare U.S. military maintenance organizations with U.S. civilian maintenance organizations. The purpose was to identify incentive practices which could be used effectively in U.S. military units to improve cost efficiencies. The technique used in this project for collecting comparative data is that of investigative reporting and organizational analysis. U.S. civilian and military maintenance organizations were critically evaluated to isolate factors which could, by their presence or absence, hinder military maintenance efficiency. It was anticipated that the analysis of civilian operations data would generate hypotheses that may have been overlooked if only military installations were investigated.

The investigative reporter model involved essentially following inefficient practive up through the organization in an effort to discover how those certain practices originate and persist. This can be contrasted with most studies that only use organizational analysis which are usually content only to describe the presence of the factor. In essence, the approach was to "pick up a string and follow it to its end." For example, if it was discovered that maintenance personnel were called off their jobs unpredictably to perform other duties such as burial detail, this practice was traced to its source. Who assigned the men to other duties? Why were maintenance men selected rather than another less critical classification? Can assignments be made more predictable? Etc.? Such questions require moving through, and up, the organization from level to level to uncover the rationale (or lack of it) that fosters the inefficient procedure.

1.5 Results: First Year's Program

A major finding was the disruptive characteristics of the current scheduling procedures. Characteristics such as short lead time, somewhat unpredictable demands, little coordination between demand sources, demands originating from multiple sources, and conflicts between immediate needs and long-range priorities, all contributed adversely to efficient maintenance practices.

Supervisors found it difficult to administer proper on-the-job training (OJT). On the one hand, activities other than maintenance appeared to have priority over maintenance-related activities, resulting in mechanics being pulled off their maintenance job. Maintenance teams end up shorthanded, yielding an inadequate amount of time for maintenance and provision for systematic OJT. On the other hand, many times the mechanics who are pulled off for other duties are the ones who would be acting as OJT trainers. Therefore, manpower time scheduling is not the only problem, it is also skill level scheduling. Through proper scheduling of time and maintaining a balanced ratio between abilities, perhaps OJT could become more systemized.

Problems also arise in scheduling activities within a maintenance unit. Supervisors indicated that they do not know who nor how many people will be available for any particular day. As a result, estimated times of task completion are difficult and overtime is required to complete work. Often, inexperienced mechanics are sent to perform a task, good parts are replaced in problem isolation attempts, and an inordinate amount of time is spent completing tasks.

Many times military mechanics do not finish the task they begin. This results in a lack of potential intrinsic motivation offered by task

closure. In addition, there is increased start-up times. Picture the sequence of activities that take place each time a task is started. The mechanic prepares for the job by taking his tool box, work orders, and the appropriate technical manuals to the work site. After displaying the proper tools, procuring needed parts, and beginning the job, he receives notice that he is required elsewhere. He must put away the materials and go. At this point, depending on the priority of that job, someone will take over or the originator may restart the task when he returns. If someone else takes over, he must go through the start-up procedure as described above, and figure out what the task originator had accomplished.

There are problems in the transition period between duties. A manpower user (i.e., personnel race relations training) may require a mechanic's time for a half day. Many times the mechanic is not seen for the rest of the day. Reasons for this vary, but informal conversations with supervisors revealed that individuals end up using the rest of the working day for personal matters. Unfortunately, this behavior affects both the individual and the entire maintenance unit, because one way or another the maintenance work must be completed.

The individual within the large military organization suffers from role conflict. Frustration comes from the individual expecting the mechanic role to be primary upon arrival to the work station, where in reality it is second to the role of being a soldier. In brief, Army mechanics like the field of helicopter maintenance. They are, in comparison with civilian mechanics, generally satisfied with their pay, their social environment, and even their supervisors. However, they do not think much of their job as it is defined by the Army. Compared to civilians, they have less pride in their units, they think that their job has little significance or task identity, and that is exercised few of their skills. They feel their autonomy is low, and that they receive minimal feedback from the job

itself. Accordingly, they have little motification to perform. They feel a need for growth, and in all probability, will seek this growth outside the military.

1.6 Technical Approach: Second Years Program

The focus of the second year was on one particular organizational variable identified in the first year. Rather than adding additional incentives for a demonstration study it was hypothesized that a reduction of existing disincentives would result in the greatest payoff. The first year's study and the supporting evidence, as presented below, was the reason for this decision.

Reduce the Impact of Disruptions on Maintenance Effectiveness and Efficiency. Interviews with military maintenance personnel revealed an almost universal belief that maintenance efficiency was being adversely affected by required non-maintenance duties and activities. These include such things as guard duty, garden and lawn maintenance, burial duty, parades, barracks inspection, and other training (CBR, race relations, etc.). One unit visited had compiled data from a two week period showing over 50% of the available man hours were lost to non-maintenance activities. Although it might be possible to reduce the amount of duties through the establishment of MOS classifications to handle some of the routine assignments (e.g., military police to handle all guard duty), it is unlikely that this would become reality nor is it likely to materially reduce the overall time requirement for all non-maintenance duties. Nevertheless, every effort should be made to reduce the total non-maintenance time committments required of mechanics.

It seems likely, that without major system disruptions, a procedure could be developed to reduce the impact of such time committments on the overall

efficiency of the units. Currently, it is difficult for maintenance supervisors to make long term manpower-task allocations because they do not know what non-maintenance commitments will have to be filled, and who will be available. Extra duties or training classes that require a half day effectively preclude any work for the whole day. If it were possible to schedule training and extra duties more effectively, it would be possible to reduce the total maintenance time loss.

The data show that military mechanics would like to spend more time doing maintenance. This indicates that, through better scheduling, any extra maintenance time would probably be put to constructive use by the mechanics. Further, with better scheduling, it might be possible for supervisors to plan systematic on-the-job training, with some assurance of who would be available on a given day. Military mechanics rated OJT as the most helpful form of training, yet supervisors complained that it was difficult to provide OJT because of the instability of their daily work force.

Our data suggest that the more time that is spent doing maintenance, and the less time lost, the lower the NORM, NORS and manhours per aircraft figures. This, of course, makes sense. Reducing the impact of disruptions by reducing the amount, and through rescheduling, of disruptions may yield high payoffs in efficiency and effectiveness.

It was not the purpose of this study to make value judgments concerning the priority of activities a soldier must perform, rather it was to minimize the disruptive impact due to the variability of manpower allocation on aircraft maintenance. The approach taken was to investigate experimentally the affects of implementing a new method for scheduling non-maintenance activities. A pre-test/post-test paradigm was used where baseline data were collected, the new scheduling system was implemented, and system evaluation data were then collected. The effects of the new scheduling

system was evaluated in terms of changes in maintenance capabilities and job perceptions. The goal of this program was to minimize the disruptive characteristics of the current non-maintenance activity scheduling on aviation maintenance while still meeting all manpower demands required for overall system functioning. The results of the second year's program are presented in the following sections of this report.

The specific approach taken involved performing the following sequencial tasks:

(1) Perform a job analysis of a representative U.S. Army aviation system.

(2) Based on the allocation characteristics formulate an optimum scheduling strategy considering the system constraints.

(3) Collect baseline data including objective and subjective measures from the target population.

(4) Begin demonstration study by implementing the new scheduling method for non-maintenance activities.

(5) Collect evaluation data to assess the effects of the intervention.

2. JOB ANALYSIS: THE HUMAN RESOURCE

2.1 Objectives

The job of the U.S. Army individual is multi-faceted, meaning that he or she performs many other tasks in addition to the primary military occupational specialty. Objectives of this portion of the study were to analyze the overall job of aviation maintenance personnel in order to determine the types of activities performed in addition to maintenance, the amount of time spent in each activity, and the current procedure for activity allocation. The purpose of obtaining this information was to formulate a new scheduling approach for performing all activities the soldier performs while being conducive to efficient performance in both aviation maintenance and other activities.

2.2 Approach

The approach used here was to select a representative sample population of aviation maintenance personnel maintaining a cross-section of aviation equipment complexity and perform a comprehensive activity analysis. A detailed discussion of the procedures used follows below.

2.2.1 Site Selection. III Corps and Fort Hood stood out as a most promising location for the manpower survey, the reason being that the maintenance organizations at this site were all high on the selection criteria used in our determination. These criteria were: high operational readiness rates; high priority given to equipment maintenance; high overall organization motivation; research oriented; receptive to new ideas; and cooperative. W thin the III Corps organization, the 6th Cavalry Brigade, the Army's only air cavalry, appeared particularly desirable. In one respect, the size of the organization was manageable

but still representative of the Army. In another respect, the 6th Cavalry is itself an Army experiment; as such, the unit was experienced in being tested and evaluated. Since the maintenance personnel had this experience, it increased the chance that we would obtain normal day-to-day functioning of the existing manpower scheduling procedures. Within the 6th Cavalry Brigade, C Troop of the 4th Squadron, of the 9th Cavalry, and C and D companies of the 34th Support Battalion, participated in the survey. C Troop is comprised of four major platoons: (1) Weapons (AH-1H helicopters), (2) Reconnaissance (UH-1H helicopters), and (3) Service (maintenance). The maintenance performed by the platoons is at the organizational level with the exception of the service platoon which performs intermediary maintenance. C and D companies perform direct support maintenance on the UH-1H and C-47 helicopters, respectively. In all three units, only the manpower of the MOS series 67 and 68 were studied.

2.2.2 Equipment System Selection. To focus the specific comparative examination of U.S. military and U.S. civilian maintenance organizations, initial selection was made of a system maintained by both groups. The basic requirements of candidate systems were that they be used in the same, or nearly the same, form by the U.S. military and by U.S. civilian organizations. Complete systems were favored over components. It was also desired that the systems be used in combat, be representative of modern mechanisms, both electronically and mechanically, and have some degree of criticality in use, so as to provide motivation for proper maintenance. Based on a standard of suitability for the purposes of this study, aircraft systems were superior to others, helicopters were superior to airplanes, and light helicopters had the most favorable characteristics overall. Based on a survey of currently-available light helicopters, the Bell Model 206 JetRanger appeared to best fit the criteria for this study and was selected as the focal system. The

JetRanger helicopter is a single-crew, 4 to 5-person helicopter powered by an Allison turbine engine. It weighs about 3,000 pounds, has a maximum speed of 120-140 knots, and climbs to 20,000 feet in the civilian version. For the purposes of the first year's study, three main configurations were used: (1) Model OH-58A Kiowa (the Army's version), (2) Model 206B JetRanger (the civilian version), (3) Model TH-57A Sea Ranger (the Navy version). The Army's version, the Kiowa, is shown in Figure 2-1. As a multi-purpose aircraft, the JetRanger featured a variety of subsystems; these include: (1) airframe, (2) powerplant, (3) transmission and drive-train, (4) flight control, (5) fuel and oil, (6) electrical, (7) avionics, and (8) interior and ventilation. In addition, the aircraft can be fitted with various accessories for its special-purpose applications. Each subsystem involves individual problems of check-out, diagnosis and parts supply, and can be taken as representative of similar systems in the same category

For the second year program the scope of equipment complexity was broadened to include other helicopter systems in addition to the JetRanger. The JetRanger was well-suited for military and civilian operation comparison, but was not adequate in making comparisons within military maintenance organizations. It became apparent that the JetRanger was relatively too simple to maintain as compared to other helicopters in the military inventory. Through observation of the system we found that groups maintaining the JetRanger were higher on certain performance measures (i.e., Operational Readiness Rates) than groups maintaining other helicopter systems. This gave the outward appearance that some maintenance groups were better than other maintenance groups, whereas in reality it was the complexity of the aircraft which caused the variance. Therefore, more complex helicopter systems of the UH-1H (see Figure 2-2), the AH-1G (see Figure 2-3), and the C-47 (see Figure 2-4) were included in the study. A representative sample of Army maintenance was thus obtained which was

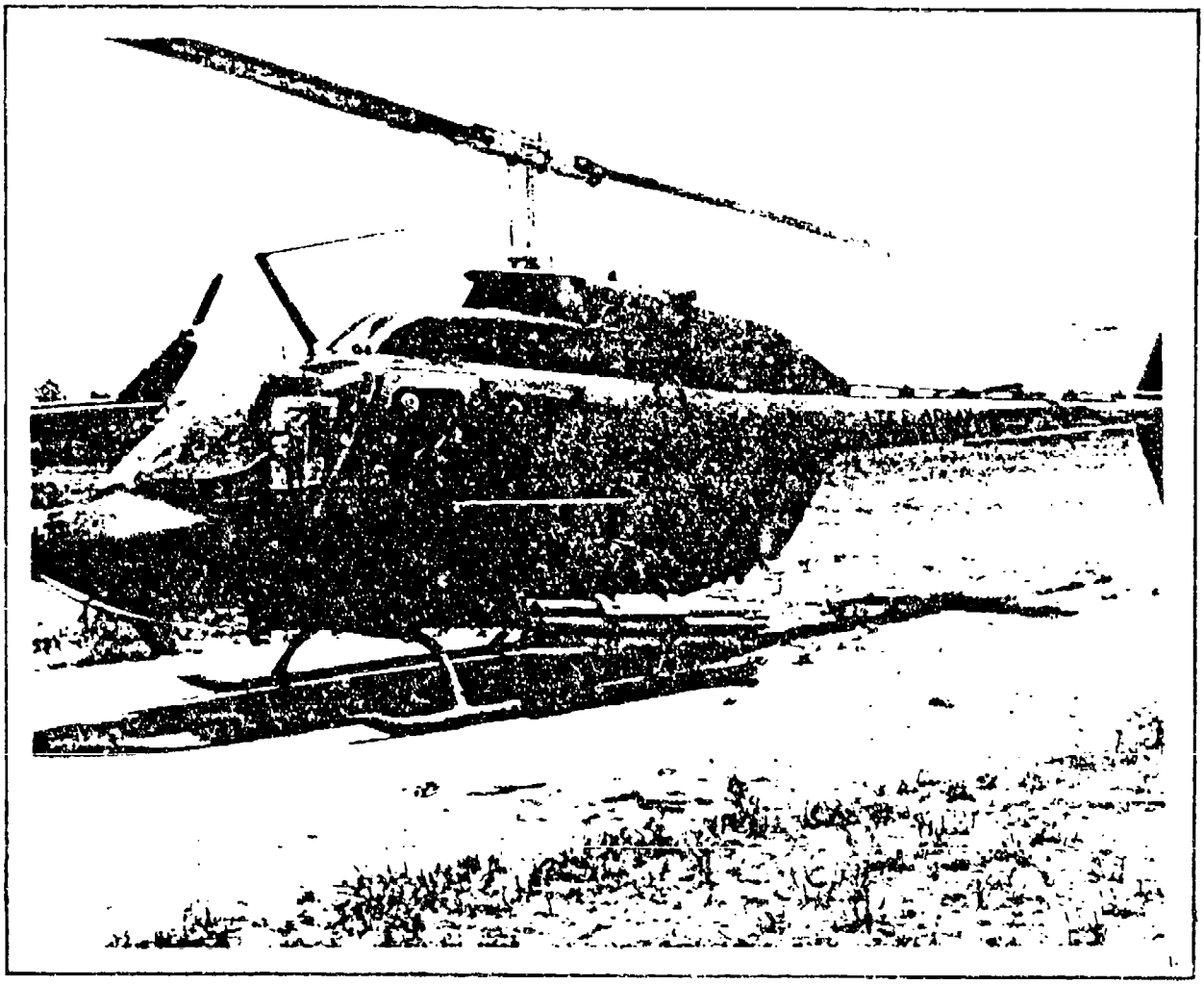


FIGURE 2-1.
U.S. ARMY OH-58A (KIOWA)

FIGURE 2-2.
U.S. ARMY UH-1H (HUEY)

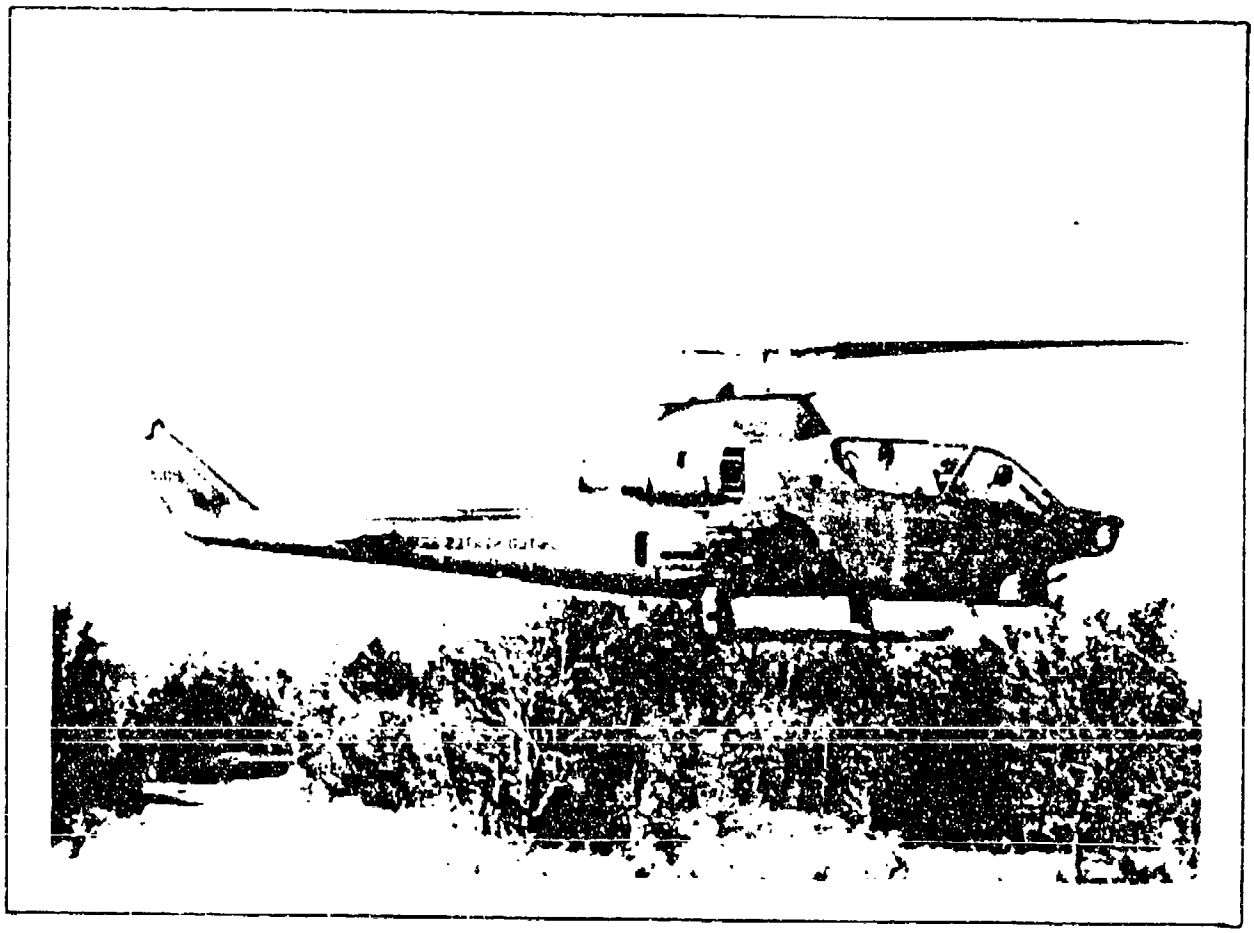


FIGURE 2-3.
U.S. ARMY AH-IG (COBRA)

FIGURE 2-4.
U.S. ARMY C-47 (CHINOOK)

more indicative of the overall maintenance performance picture. The more simplistic maintainability of the JetRanger would have been likely to absorb any recordable performance change as the result of implementing a new manpower scheduling method. By increasing the range of maintenance difficulty, changes in performance measures relating to the intervention would be measurable. The physical characteristics which differentiate the equipment systems are displayed in Table 2-1.

2.2.3 Activity Analysis. Certain information was required to perform the job requirements analysis. One category of information sought was an estimate by maintenance supervisors of the manpower requests they received and/or administered in addition to aircraft maintenance. Within this category, the information required included such items as demanding sources, number of requests, task duration, etc.; in general, those kinds of information indicating the flow of taskings from the originator through to the individual mechanic who performs the task. The second category of information desired was a day-by-day account of each maintenance person at the wrench-turning level. Within this category, the information required included the time spent on aircraft maintenance as opposed to the time spent on other soldier activities. The information desired was a quantitative account of where maintenance people spent their day and a description of the sundry activities he or she performs. Based on the information needed, two data collection forms were developed: (1) the Task Demands Form (for supervisors), and (2) the Daily Task Diary (for mechanics).

2.2.4 Task Demands Form. This form required responses to six items for every task received (see Appendix B-1):

(1) Demanding Agency of Person - Tasking organization.
(2) Lead Time - The amount of time the supervisor was given to provide a person to perform the task.

TABLE 2-1. HELICOPTER SYSTEM COMPARISON

MANUFACTURER	BELL (MODEL 206)	BELL (MODEL 205)	BELL (MODEL 209)	BOEING (MODEL 114)
Dod designation	OH-58A	UH-IH	AH-IG	C-47C
Popular name	Kiowa	Huey	Cobrc	Chinook
Number in crew	2	2	2	3
Number of passengers	2	11	0	44
Maximum height (ft.)	9.6	14.8	13.6	18.7
Empty weight (lbs.)	1,561	5,210	5,601	21,735
Normal gross weight	3,000	9,500	9,500	46,000
Maximum speed (MPH)	138	127	219	190
Hover ceiling in ground effect (ft.)	10,600	13,600	9,300	15,000
Still-air range (Mi.)	320	289	389	432
Mission	Observation	Transport	Attack	Heavy Transport

(3) Reason for Request - The function for which the person(s) are tasked.

(4) Number of People Sent (Names) - How many people are sent for a particular tasking and who are they.

(5) Total Time Requested to Perform Task - The length of time required to perform the particular task.

(6) Agency of Person to Whom This Request is Passed (if any) - The number of supervisory levels the tasking is passed to before it reaches the person who will perform the task.

The objectives of this form were to determine the variability between taskings and within taskings, and to illustrate the flow patterns of taskings. Supervisors were instructed on how to fill out the form and were asked to complete and drop them into a data collection box (which was provided) every day for a thirty-day period. This period ranged from 5/1/78 to 5/31/78.

2.2.5 Daily Task Diary. The daily task diary was developed for direct man-hour accounting and was accomplished by soldiers maintaining a daily activity diary (see Appendix A-1). From interviews with several maintenance personnel, a taxonomy of activities was generated to encompass the most probable jobs a soldier might perform in a normal peacetime operation. Where there was a behavior not described, the form has a place to write a description of that particular activity. These activities, represented by an acronym, were placed on a 24-hour time scale. Activities and their operational definitions, as were used in this study, are displayed in Table 2-2. The form itself was reduced and put onto a 3 x 5 card. This was done because mechanics tend to mutilate any paperwork they have to hold onto, due to the nature of the job. The 3 x 5 card size was selected because it easily fit into the military work uniform (fatigues) pockets, and was made of a heavy gauge paper to be more durable than

TABLE 2-2. OPERATIONAL DEFINITIONS OF TERMS USED ON THE DAILY TASK DIARY

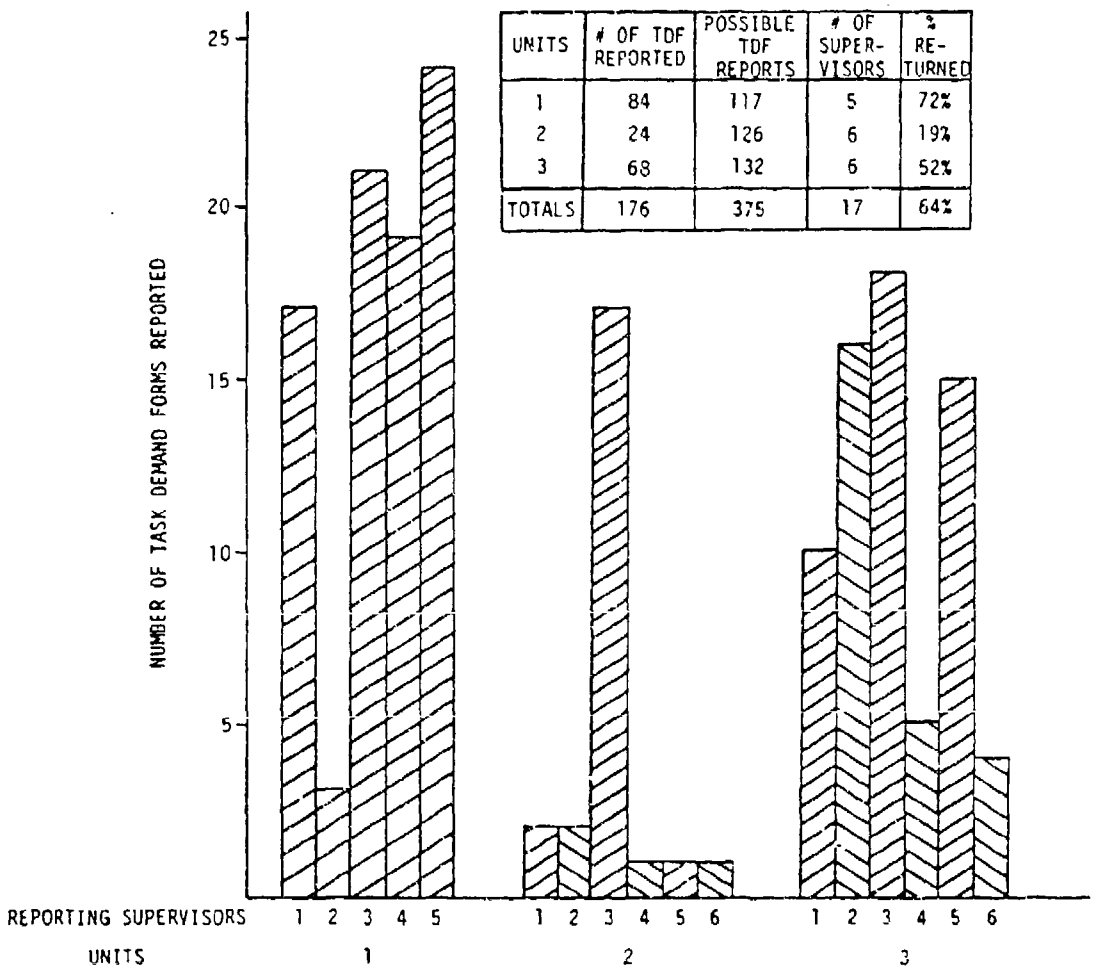
JOB CATEGORY	ACTIVITIES PERFORMED
WORK CATEGORY	
Aircraft Maintenance	Direct maintenance on aircraft from inspections to removal & replacement of parts.
Cleaning Work Area	Cleaning immediate work area (e.g., mopping and policing).
Launching and Recovering Aircraft	Preflight-postflight inspections and securing aircraft.
Mission Support	Supporting the mission of other troops.
Other Work Activities	Any activity not listed on the form.
Slacktime	Periods of inactivity at the work area.
Traveltime	The time required to travel between tasks.
Vehicle Maintenance	Working at the motor stables.
TRAINING CATEGORY	
Classroom Training for Maintenance	Training on aircraft maintenance.
Classroom Training for Other	Example: Rap II.
OJT for Maintenance	Initial aircraft maintenance training for Tech school graduates.
Outdoor Training for Maintenance	Hands on training for aircraft maintenance.
Outdoor Training for Other	Example: Field training exercises.
Physical Training	Group exercising.
DUTY CATEGORY	
Formation/Policing/Inspection	Daily troop formations.
Recovery Time	The amount of time required to recover from a tasking (e.g., showering after PT).
Squadron Duty	Duty guard, driver.
Troop Duty	Charge of quarters (CQ), CQ Runner.
PERSONAL CATEGORY	
Eating	Includes only lunchtime.
Off Duty	Includes on the hours that a person would normally be working.
Personal Affairs	Check cashing, haircuts, domestic, etc.
Sick Call	During normal working hours.

regular paper. Mechanics were instructed on how to fill out the forms and were told to fill out cards every day they worked during the period of 5/1/78 to 5/31/78. Cards were put into a collection box so designed that it indicated a valid Department of Defense study. This was done so that the mechanic would respond honestly to the survey, especially when indicating activities such as slacktime.

2.3 Results of Survey

2.3.1 Task Demands Form. The overall return rate for the task demands form was 64%. Figure 2-5 illustrates the differences between units in response to the survey. Unit number one gave a good return rate (72%), unit number three gave a moderate return rate (52%), and unit number two gave a poor return rate (19%). It is not known whether supervisors in the lower responding units didn't document taskings for a particular day because there were no taskings, or there were taskings which they failed to report. We, therefore, are not sure that the data received for a particular unit is a function of actual tasking demands or a function of the return rate. For example: If unit X shows four times the amount of taskings for the firing range as does unit Y, is this because unit X goes to the firing range more frequently than Y? Or is it because unit Y failed to report all of its taskings? Analyzing the combined units' tasking data reduces the possibility of extraneous variables affecting the data, and yields a good overall sample, achieving the objectives of the survey. That is, to determine: (1) where the sources of task demands originate; (2) the different kinds of taskings; and (3) tasking procedures.

2.3.2 Daily Task Diary. The return rate of the daily task diary is not as critical as the task demands form. A higher or lower return rate indicates the magnitude of the sample size and thus the strength of the conclusions that can be drawn; whereas, with the task demands form, a



UNITS	# OF TDF REPORTED	POSSIBLE TDF REPORTS	# OF SUPER-VISORS	% RE-TURNED
1	84	117	5	72%
2	24	126	6	19%
3	68	132	6	52%
TOTALS	176	375	17	64%

FIGURE 2-5.
THE NUMBER OF TASK DEMAND FORMS RETURNED
BY THE SUPERVISORS IN THE THREE UNITS SURVEYED

differential low return rate among units may have dubious meaning. The data obtained from the activity diary is very impressive in terms of the large number of persons responding (see Table 2-3). A total of 132 persons responded, which accounted for 12,180 man hours. In other words, these data represent 5.86 man years of work.

One possible caveat of the data is that observing the manpower requirements for only the month of May is possibly not representative. It may be that any one 30-day period in the military setting is not enough time to document all the activities which may occur. The non-maintenance tasks performed in May are not necessarily the same tasks which will be performed in December. This is due to the fact that many things have annual requirements, such as training, and can be performed any time within that time span. Other taskings are seasonal in nature. For instance, lifeguards are called for in the summer months, whereas animal preserve guards are called for during the hunting season. Therefore, with the multitude of tasks the military person performs, the whole array of tasks could be different for each different month. Although a large number of tasks performed by the military mechanic may not be represented here, a more than sufficient number of cases are presented to evaluate how the current system of human resource scheduling functionally operates.

2.3.3 Survey Data Organization. The results from the survey are presented in two major sections. The first section is an analysis of tasking data obtained from the Task Demands Form. This section includes the activities and subsequent taskings that occurred during the survey period, along with the sources of manpower demand. Characteristics of the current manpower demand are identified through the parameters of (1) percent of total requests, (2) percent of total people requested, (3) percent of total task time requested, and (4) percent of the total manpower to perform tasks. These characteristics include activities

TABLE 2-3. RETURN RATE FOR THE DAILY TASK DIARY

Unit	# of Persons Responding	# of Cards	Average # of Cards Per Person	# of Cards Possible	Return Rate
1	37	369	9.97	814	45%
2	43	441	10.26	903	49%
3	52	478	9.19	1144	42%
Total	132	1288	9.76	2861	45%

performed during the survey period, except for aircraft maintenance. The purpose of this part of the survey was twofold. On one hand, it was to determine the taskings levied that required taking manpower away from maintaining helicopters; on the other hand, it was to assess the flow of tasking information from the demand origination to the person(s) who actually perform the task. The second section involves identification of all the activities a maintenance person performs, including both maintenance and non-maintenance activities. This information was obtained by mechanics maintaining a daily activity diary. The purpose of this part of the survey was for a direct man-hour accounting of what mechanics do on a routine daily schedule.

2.4 Task Demands Analysis

Supervisors, from Platoon Sergeants down to Team Leaders, were given a Task Demands Form to record all tasking demands placed on them during the course of a day for a 30 day period. The information obtained included: (1) the tasking source, (2) how much leadtime was given, (3) the purpose of the tasking, (4) the number of persons requested, and (5) the time requirements for each tasking.

A list of activities was generated from the tasking information obtained from the Task Demands Form. These activities represent the taskings that were levied during the survey period. For ease of discussion, the activities were grouped into six categories, according to the source to which the taskings originated. The categories consist of taskings for classroom training, taskings for job related activities, and taskings that originated from different levels of command. Classroom training activities were those functions that occurred in a classroom atmosphere. Job related activites were functions soldiers performed as part of their overall job, in addition to aircraft maintenance. Requirements for manpower were requested at various times by different levels of command.

The levels of command using manpower were identified as Troop, Squadron, Brigade, and III Corps. In most other military command structures, the Brigade level would be followed by the Division level, but as previously indicated, the 6th Cavalary Brigade is an Army experiment and communicates directly with III Corps. The activities and subsequent categorization are shown in Table 2-4. These activities could possibly be grouped in various ways, but were grouped in this way to facilitate the particular needs of the study.

The number of individuals required for non-maintenance activities and the length of time required to perform the various tasks also are displayed in Table 2-4. The numbers underlined in the Table represent the relationship between categories; all other numbers represent the relationship of activities to each other within a category. Classroom training involved 5 percent of the individuals sampled and accounted for 12 percent of the total available tasktime. Sixty-seven percent of the troops that were requested for non-maintenance activities spent only 16 percent of the total available tasktime in performance of activities in the Job Related category. Job related here refers to those activities that are part of the soldier's overall job, in addition to the aviation maintenance aspect, that requires actual physical relocation from the maintenance work area to perform the tasks. It is apparent that many times the same individual was tasked for these kinds of activities more than once during the course of the month surveyed. The large number of people tasked with the relatively small amount of tasktime suggests that mechanics were going back and forth across categories of activities. Activities initiated at Troop level involved 16 percent of the total available people, but required 32 percent of the total tasktime. As compared to job related activities, approximately one-fourth as many people were involved with twice the tasktime. Activities in the Troop category involve mainly those taskings that are commonly referred to as

TABLE 2-4. NON-MAINTENANCE ACTIVITIES REPORTED BY THE TASK DEMANDS FORM

TASKING CATEGORIES	Number of Persons Requested	Percent Total People	Total Tasktime (Hrs) Requested	Percent Total Tasktime
Category: Classroom Training	42	5	232	12
PLL School	3	7	192	83
Water Safety	20	48	10	5
UCMJ	5	12	1	1
DDC	3	7	15	6
Pilot Training	3	7	8	2
Rap II	8	19	6	3
Category: Job Related	480	67	318	16
Motor Stables	147	31	144	45
Tool Inventory	33	7	3	1
Supply (hardware)	4	1	32	10
Firing Range	199	41	90	28
Cleaning Weapons	90	19	35	11
Field Training	7	1	14	4
Category: Troop	131	16	653	32
Duty Guard	6	5	240	37
Troop Duty	8	6	60	9
Baseball	3	2	3	*
Mail Clerk	2	2	6	1
Prisoner Escort	1	1	5	1
Inprocessor Escort	3	2	18	3
1st Sgt. Details	13	10	52	8
Inspections	16	13	17	3
Stan Rides	17	13	82	13
Load Mess Truck	4	3	2	*
Police Firing Range	56	41	156	24
Parades	2	2	12	2
Category: Squadron	24	3	119	6
Commander's Forum	5	21	5	4
CSM Details	17	71	98	82
Area Beautification	2	8	16	13
Category: Brigade	23	3	594	29
Life Guard	3	13	160	27
Records Audit	4	17	2	*
Killeen Airport	2	9	320	54
Brigade Details	14	61	112	19
Category: III Corps	45	6	98	5
Spt National Guard	42	3	96	98
CID	3	7	2	2

* Less than 1%

"details." The data indicate that a smaller part of the work force is spending the entire day away from the maintenance work area. Brigade level activities had the least amount of taskings, but were second to the Troop category in the amount of total tasktime requirements. This suggests that these kinds of taskings are for extended periods of time requiring only a few individuals. An example of this is a lifeguard tasking which may require a person for a period of four months. Put another way, 15 mandays were lost to this particular activity. Squadron and III Corps initiated activities each account for only 3 percent of the total persons requested, and used only 6 percent and 5 percent respectively, of the total non-maintenance tasktime.

Looking at the categories of non-maintenance activities across all four assessment parameters, as displayed in Table 2-5, provides an overall picture of the current manpower utilization. These parameters, consisting of requests, number of people, tasktime and manhours, are displayed as percentages. The table is partially redundant to Table 2-4 but the data are shown again to facilitate comparisons. Job related taskings required 64 percent of the available manpower, only took 16 percent of the non-maintenance tasktime, yet accounted for nearly half of the total manhours. Troop level taskings used 18 percent of the total available manpower with 32 percent of the tasktime, but accounted for 30 percent of the total manhours. In comparison Job Related taskings required half the tasktime as is Troop level taskings but expended over one and a half times the manhours. There was approximately one manhour of work for each person requested for Troop level, whereas for Job Related, there was a half hour tasktime for each tasking with more people involved and required one-third more manhours. This indicates that especially for Job Related activities, mechanics perform one or more of the same tasks more than once. Maintenance persons are, therefore, required to go back and forth across different types of jobs during the course of a day. This results

TABLE 2-5. ANALYSIS OF MANPOWER TASKINGS

CATEGORIES OF NON-MAINTENANCE ACTIVITIES	MANPOWER ASSESSMENT PARAMETERS			
	PERCENT TOTAL REQUESTS (N=186)	PERCENT TOTAL PEOPLE (N=745)	PERCENT TOTAL TASKTIME (N=2014)	PERCENT TOTAL MANHOURS (N=6390)
CLASSROOM TRAINING TASKINGS	8	6	12	4
JOB RELATED TASKINGS	32	64	16	49
TROOP LEVEL TASKINGS	31	18	32	30
SQUADRON LEVEL TASKINGS	8	3	6	3
BRIGADE LEVEL TASKINGS	11	3	29	13
III CORPS TASKINGS	10	6	5	1

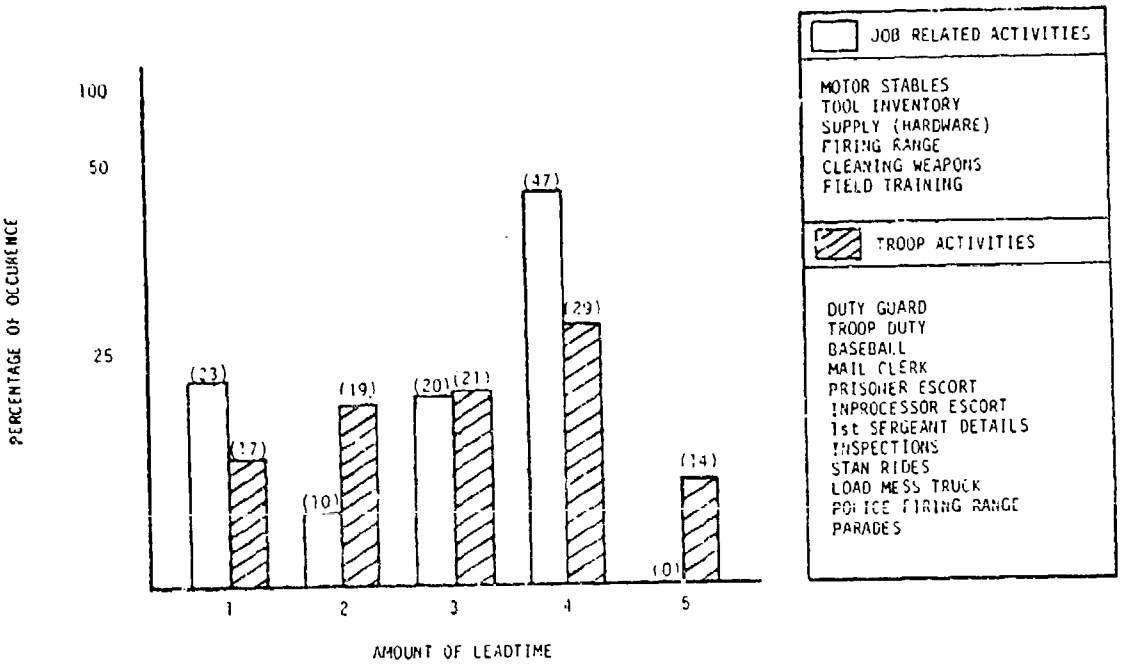
not only in time away from maintenance but also intermittent interruptions while performing maintenance.

From interviews with the maintenance personnel, we found the taskings of the Squadron level, specifically sergeant major details, to be highly disruptive to maintenance. According to the data, these activities account for only 6 percent of the total tasktime and 3 percent of the total non-maintenance manhours. The relatively low percentages which reflect low concurrence with interviews may be explained by two factors. One factor is a caveat of the data explained previously, that is, all the data (taskings) were not reported. The other factor is that command sergeant major (CSM) details become absorbed into another activity category. In support of this supposition, we found through post data collection interviews that many details referred to as 1st sergeant details were actually CSM details. From the perception of those filling out the Task Demands Form, the 1st sergeant was the source of the taskings. Brigade level taskings contributed to nearly one-third of the total tasktime while taking only 13 percent of the manhours. The reason for this is that these kinds of taskings usually require one person for extended periods of time rather than several persons being tasked for varied durations. For instance, an airport attendant (one who provides Post information to traveling military personnel) is usually detailed for a 30 day period.

The requirements for III Corps taskings vary the most. During one month, there may be several taskings, and during another month there may be few or none. During the survey period, III Corps and Fort Hood were supporting a training exercise for the National Guard, which required manpower to erect tents, and explains why 5 percent of the tasktime was used.

Leadtimes for producing an individual or individuals for a non-maintenance tasking requests were assessed to determine how much time the first sergeant had to manage the adjustment of his human resources. To illustrate leadtime, activities from both the job related activity category and the Troop activity category were used. Collectively, these two categories accounted for 63 percent of the total tasking requests and contained activities pertinent to the "normal" job of the Army individual. The range of occurrences for different leadtimes for both job related activites and Troop activities are presented in Figure 2-6. The most frequent leadtimes occurred from two days to one week for both job related activities and Troop activities. The rest of the leadtimes range from an immediate need to needing a person in a week or more with leadtimes being, more or less, evenly distributed. This indicates that there is an equal probability that any one of the various leadtimes could occur. Relatively speaking, there was an exceedingly high proportion of cases that virtually no leadtime was given at all. Manpower demands of this nature where the leadtime is a quasi-random variable and where 20 percent of the time no leadtime is given at all, poses a particularly difficult management problem. For instance, supervisors were not able to effectively compensate for the loss of people due to the current non-maintenance task scheduling system being demand-responsive to unknown peak demands.

The problems incurred with leadtime are exacerbated by the inclusion of tasktime variables. The percentage of occurrences of various tasktimes of both job related activities and Troop related activities are presented in Figure 2-7. Tasktimes in the range of 2 days to 1 week occur most frequently and corresponds to leadtime. In other words most of the leadtimes are from 2 days to 1 week and most of the tasktimes fall in the same range. Although the rest of the distribution of tasktimes is not flat and indicates that for any given leadtime there may be a different



LEADTIME RANGES

1 - 1/2 TO 1/2 HOUR

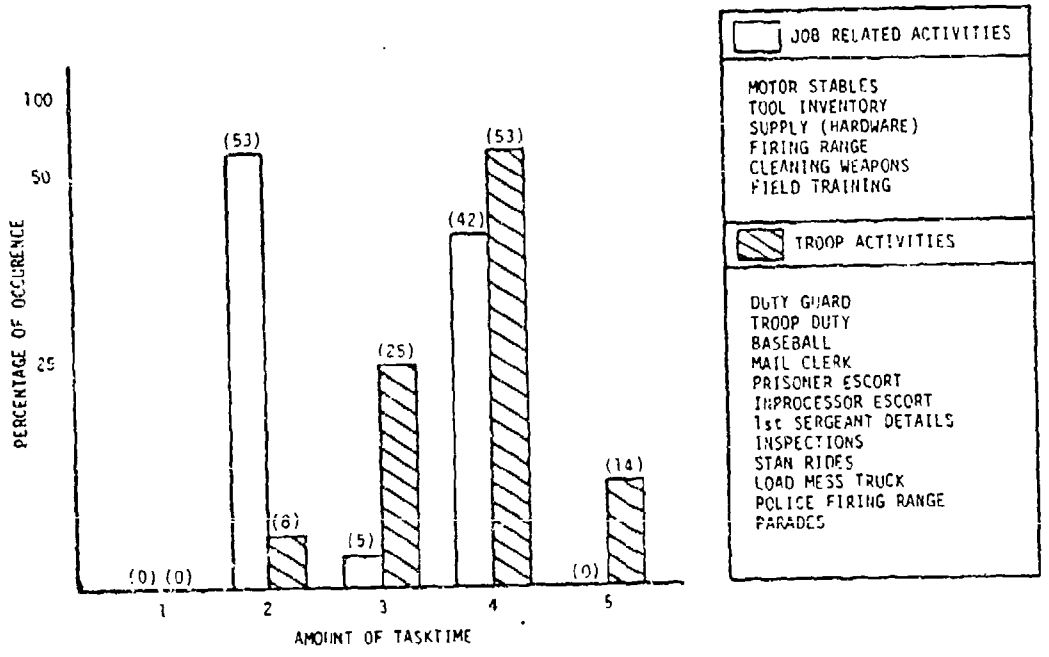
2 - 1/2 HOUR TO 4 HOURS

3 - 5 HOURS TO 1 DAY

4 - 2 DAYS TO 1 WEEK

5 - 1 WEEK AND A DAY OR MORE

FIGURE 2-6.
THE FREQUENCY OF OCCURRENCE OF LEADTIMES GIVEN TO THE FIRST SERGEANT TO PRODUCE AN INDIVIDUAL FOR A NON-MAINTENANCE



LEADTIME RANGES

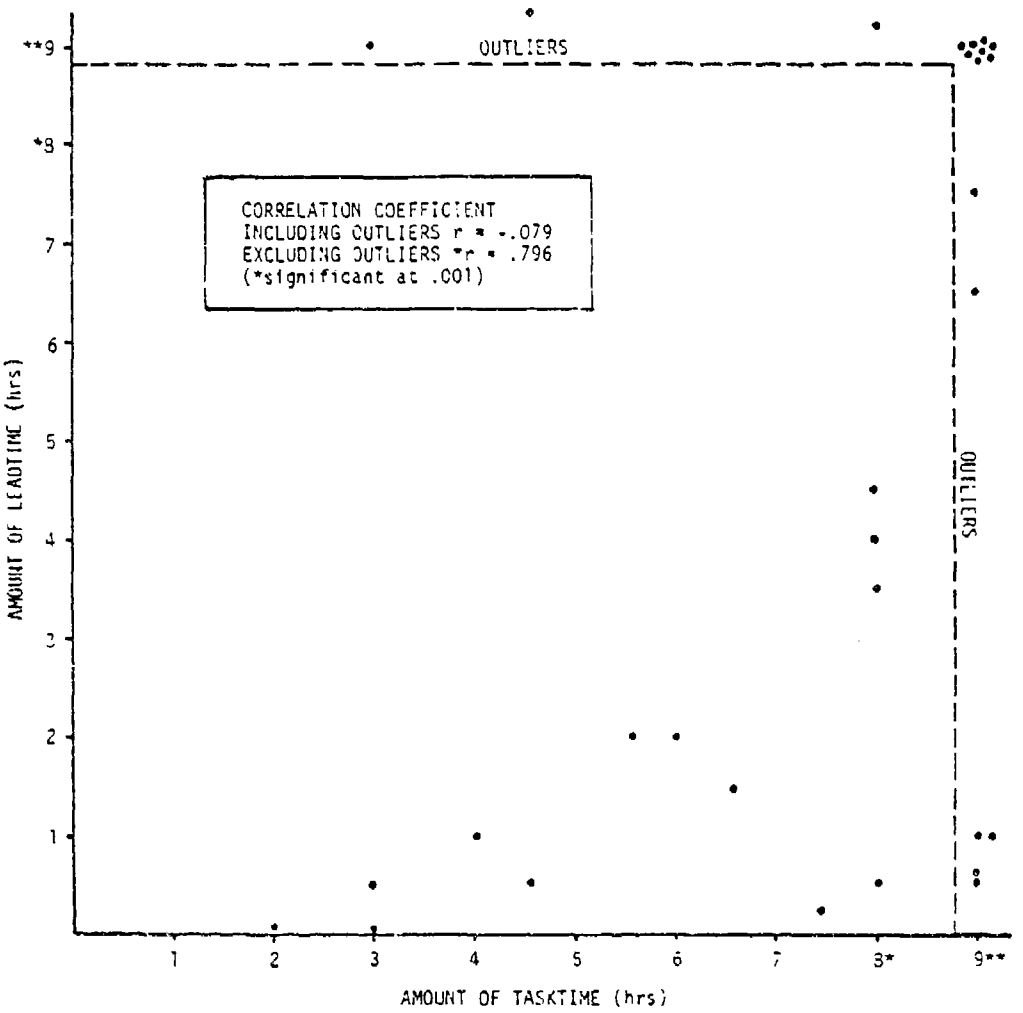
1 - 0 TO 1/2 HOUR
2 - 1/2 HOUR TO 4 HOURS
3 - 5 HOURS TO 1 DAY
4 - 2 DAYS TO 1 WEEK
5 - 1 WEEK AND A DAY OR MORE

FIGURE 2-7.
THE FREQUENCY OF OCCURRENCE OF THE AMOUNT OF TIME TROOPS WERE AWAY FROM MAINTENANCE ACTIVITY TO PERFORM NON-MAINTENANCE TASKINGS

amount of tasktime. This, of course, adds to the first sergeant's management problem. Now he not only does not know when his people are going to be taken for non-maintenance taskings, but he does not know how long they will be gone. The implications here concerning manpower management for efficient and effective maintenance performance are obvious. A scattergram illustrating the relationship between leadtime and tasktime is presented in Figure 2-8. The correlation coefficient between leadtime and tasktime shows no statistical relationship. Although, when the outliers, extremely disparate data points, were deleted from the correlation, the statistical test yielded a highly significant (.001) relationship between the two variables. This means that, in the current system for scheduling non-maintenance activities, the limit for being able to predict is one day. Unfortunately, most of the characteristics of tasking requests fall out of the range of predictability.

Generally, the flow of taskings follows the path from the agency or person requiring the manpower to the agency or person who will perform the task, as shown in Figure 2-9. The demanding source can start anywhere from the maintenance team to III Corps. Explanation of a typical tasking can best be accomplished by a scenario:

> It is the month of April and the Brigade's S3 (operations officer) realizes that water safety class must begin now to have qualified people ready to send for summer lifeguard duty at Belton Lake. He calls down to the aviation squadron and requests four people to attend classes. The Squadron operations officer then requests four people from the Troop 1st Sergeant. The 1st Sergeant, depending on the amount of leadtime, would task his Platoon Sergeants, during the regular morning meeting, for four people. At this point there are several contingencies. Depending upon a platoon's maintenance load or the criticality of



*8 hours equals 1 day

**9 equals greater than 1 day ranging to 3 months

FIGURE 2-8.
THE RELATIONSHIP BETWEEN THE AMOUNT OF LEADTIME GIVEN TO PRODUCE AN INDIVIDUAL(s) FOR A TASKING AND THE AMOUNT OF TIME THE INDIVIDUAL(s) WAS GONE

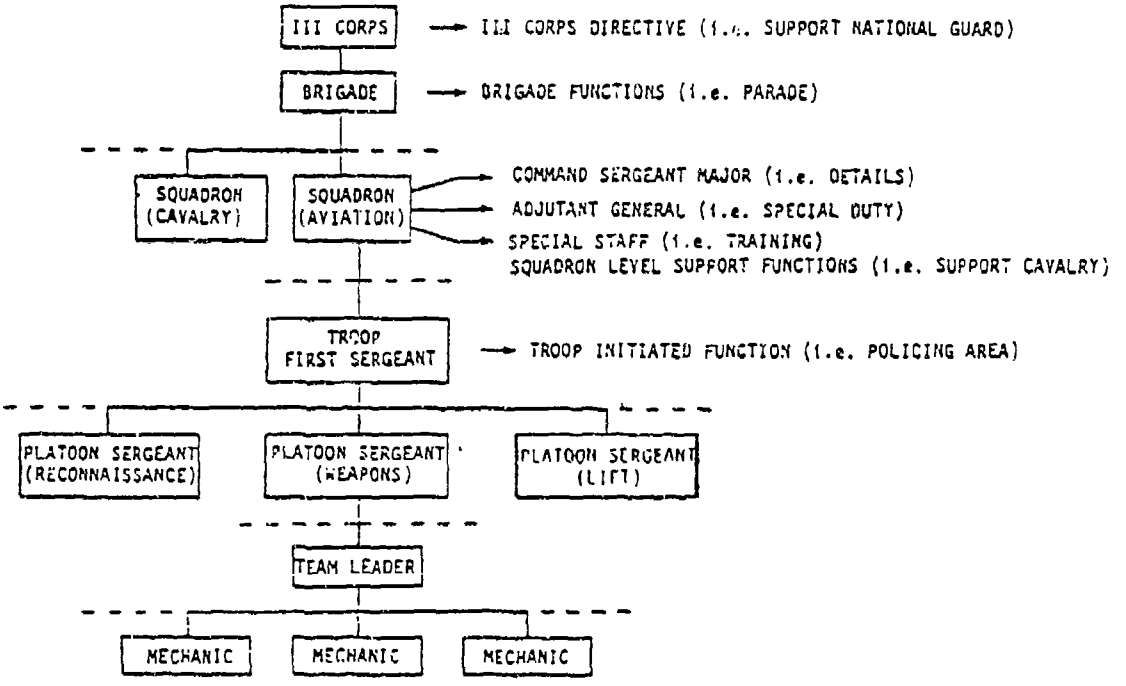


FIGURE 2-9.
A MODEL OF TASKING FLOW IN THE ORGANIZATIONAL STRUCTURE OF A U.S. ARMY AVIATION UNIT

meeting OR requirements, the men will be taken out of one or two platoons, or spread out evenly. The Platoon Sergeants would then task the team leaders, who would then select the particular individual for safety school.

There are several variations to this scenario. Many times, the selection process is based on the "hey you" method, the rotational method, the volunteer method, sending the non-productive worker, etc. Some taskings follow an informal sequence through the command sergeant major (CSM) to the 1st sergeants. Although there is no formal authority structure, the tasks are carried out because the CSM's boss is also the person who evaluates the 1st sergeant's boss, who evaluates the 1st sergeant. Other than the informal organizational lines and the variance at the Troop level caused by mission requirements, the tasking flow usually follows something similar to the above scenario. The particular organization structural flow depends on what the training requirements are or what tasks are to be performed. Training typically goes through the S3 channels, and most other taskings would follow the relevant chain of command.

2.5 Daily Activity Analysis

Troops were given a daily activity diary to report everything they did for a period of 30 days. This procedure provided a quantitative account of the mechanic's time, illustrating the variety of jobs the mechanic performs, and how much time was spent in the performance of these jobs.

Where the Task Demands Analysis showed the tasking characteristics from the task source to the level just above execution, the Daily Activity Analysis illustrates task activity at the execution level. Military

experts from Operations, the Adjutant General's office, and maintenance supervisors were queried to develop a list of the activities a soldier might perform. Four activities categories were generated and are displayed in Table 2-6. These categories are: (1) work activities; (2) training activities; (3) military duties, and (4) personal activities. The categorization and subsequent analysis of Table 2-4 data and Table 2-6 data differ in that the former was grouped after the list of taskings was obtained, whereas in the latter table, the activity categories were identified first and the activities were put into these categories. The data from the Daily Activity Analysis also included task time for MOS-related maintenance activities, whereas the Task Demands Analysis included only non-maintenance tasks. The underlined numbers in Table 2-6 represent the comparison between activity categories, and the numbers within a category represent the comparison of each activity to the larger category. Fifty-three percent of the mechanic's time was spent performing work activities which include: aircraft maintenance, cleaning of immediate work area, launch and recovery of aircraft providing support for another unit's mission, slacktime (defined as waiting to perform work activities at immediate work environment), travel time (defined as the time involved in addition to task duration), and motor pool activities. Within that category, the predominant activity was aircraft maintenance, representing 53.92%. Sixteen percent of the troop's time was spent in training, eleven percent in the performance of military duties, and nineteen percent in personal activities.

These data for the four activity categories are displayed in a histogram (see Figure 2-10) to visually illustrate the relative amount of time spent. As is shown, work activities account for more time than the three other categories combined. Breaking work activities into the activity components (see Figure 2-11) show aircraft maintenance to account for the greatest percentage of the time within the work activity category, with Other Work

TABLE 2-6. ACTIVITIES REPORTED DURING THE MONTH OF MAY

ACTIVITY CATEGORIES	Amount of Time Spent (hrs.)	Percent of Total Time Spent	Number of Manhours	Percent of Total Manhours
Category: Work Activities	6467	53.01	2155.67	54.00
Aircraft Maintenance	3487.00	53.92	1162.33	54.00
Clean Work Area	92.00	1.42	30.67	1.00
Launch/Recovery	76.00	1.18	25.17	1.00
Mission Support	207.00	3.20	69.00	3.00
Other Work Activities	1468.00	22.70	489.33	23.00
Slack Time	823.00	12.73	274.33	13.00
Travel Time	171.50	2.65	57.17	3.00
Vehicle Maintenance	142.50	2.20	47.58	2.00
Category: Training	1973.50	16.17	657.83	14.00
Classroom: Aircraft Maintenance	174.50	8.84	58.17	9.00
Classroom: Other	316.50	16.04	105.50	16.00
On-the-job-training	892.50	45.24	297.50	45.00
Outdoor: Aircraft Maintenance	131.00	6.64	43.67	7.00
Outdoor: Other	373.50	18.93	124.50	19.00
Physical Conditioning	85.50	4.33	27.60	4.00
Category: Duties	1372.50	11.25	457.50	12.00
Formation/police call/inspection	808.00	58.87	269.33	59.00
Recovery Time	38.50	2.81	12.83	3.00
Squadron Duties	321.00	23.39	107.00	23.00
Troop Duties	205.00	14.94	68.33	15.00
Category: Personal	2367.00	19.40	789.00	20.00
Eating	1369.00	57.84	456.33	58.00
Off Duty	610.00	25.77	203.33	26.00
Personal Affairs	318.00	13.43	106.00	13.00
Sick Call	70.00	2.96	23.33	3.00

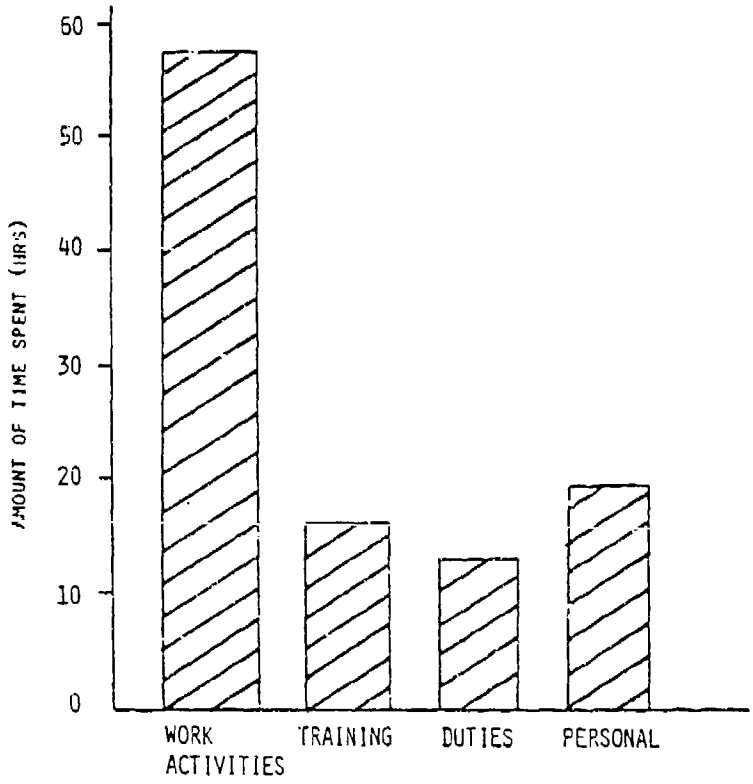


FIGURE 2-10.
THE AMOUNT OF TIME SPENT IN THE PERFORMANCE OF ACTIVITIES FOR FOUR JOB CATEGORIES.

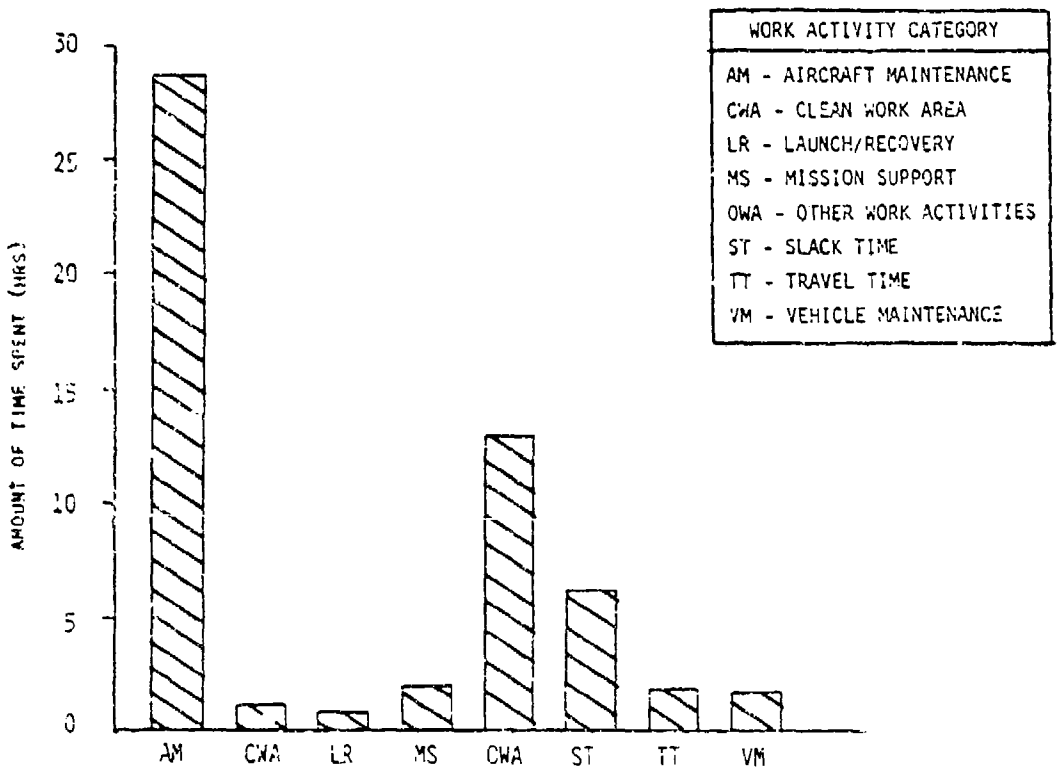


FIGURE 2-11.
THE AMOUNT OF TIME SPENT WITHIN EACH ACTIVITY OF THE WORK ACTIVITY CATEGORY

Activities accounting for the next most time spent. Other Work Activities was used as a "catch all" term to provide flexibility in case we overlooked an activity a soldier/mechanic might perform. There was a special place designated on the diary to write in any activity not already represented. A list of these Other Work Activities that were reported are shown in Table 2-7. Many of the activities shown should have been placed under one of the existing categories, but the list is still very informative in terms of illustrating the various activities the soldier/mechanic performs.

It appears that the number of hours presented for certain tasktimes may be somewhat biased. One such bias concerns the activity of travel time. It turned out that the term "travel time" was apparently not well-understood by the respondents, and it may have been subsumed within other categories. For instance, the time taken for eating seems rather high, and it may be that travel time and eating were collapsed rather than being individually delineated.

It is not known just how many different activities are represented under different categories, but overall the data have good face validity. Another caveat of the data falls under specific definitions rather than possibly skewed distributions. For example, "off duty" was defined as that time a soldier/mechanic was off duty during normal working hours rather than after duty time. Originally the activity designation was designed to show if mechanics were being pulled back during after-duty hours to perform maintenance or to recover an aircraft. This was apparently not well conveyed, which yielded inconsistent responses. Therefore, post hoc analysis was then made on a reduced but consistent body of data. Overall the data shows 4,060 man-hours of activity and represent nearly two man-years of work.

TABLE 2-7. OTHER WORK ACTIVITIES AS LISTED ON THE DAILY TASK DIARY
(in alphabetical order)

Alert	Parking guard
Build cowling rack	Preparing for guard
Carpentry	Rap II
Chaplain	Records audit
Clean gas masks	Recovery from physical training
Clean room	Safety film
Clean tool box	Security guard
Clean weapons	School to improve GT scores
DDC class	SCM detail
Escort inprocessor	Softball game
ETS interview	Softball practice
Field training	Softball tournament
Filing papers	Soldier of the month preparation
Firing range	Standby
GI party	Tent detail
Grass cutting	Tool box inventory
Load and unload mess truck	Tool room custodian
Mail orderly	Training holiday
Mail orderly class	Troop duty
Mission support	Umpire school
Motor stables	Volleyball
Out-processing	Waiting for parts
Paint trucks	Water safety

2.6 Discussion of Results

2.6.1 Overview. Individuals belonging to a U.S. Army aviation unit perform many different kinds of activities. These activities fall under three general categories. One category involves working and training within a particular military occupational speciality. Another category involves training activites for soldier preparation. The last category involves the performance of activities that support the Post, in which the soldiers serve as a source of available manpower. The overall job of the soldier is illustrated in Figure 2-12. An overriding theme concerning how the Army defines the job description of aviation maintenance personnel, evidenced by the data, is that mechanics are soldiers who perform maintenance. The MOS trained position of aviation mechanic is only one part of the overall duties performed. It was found that less than one-third of the entire work time sampled was spent on aircraft maintenance. The other two-thirds of the time was spent on activities such as: tasks related to maintenance; training; military duties; and taking care of personnel needs.

Based on the T.O. and E., the allocation of manpower is adequate to perform the required maintenance to sustain high levels of readiness, but there are two main reasons why the allocated amount of personnel is not adequate in certain operational settings. One reason is that due to the reduced amount of people joining the service, units are seldom manned according to their allotted allocation, nor are they manned according to allotted skill levels (usually slots are filled with lower skill levels). Both can cause management problems in that the former problem results in not enough people in terms of workload, and the latter problem results in not enough qualified personnel to work and administer OJT. The second reason is that manning allocation is based on the predicted maintenance requirements of a given equipment system, and does not usually take into account all the other activities the manpower is used for.

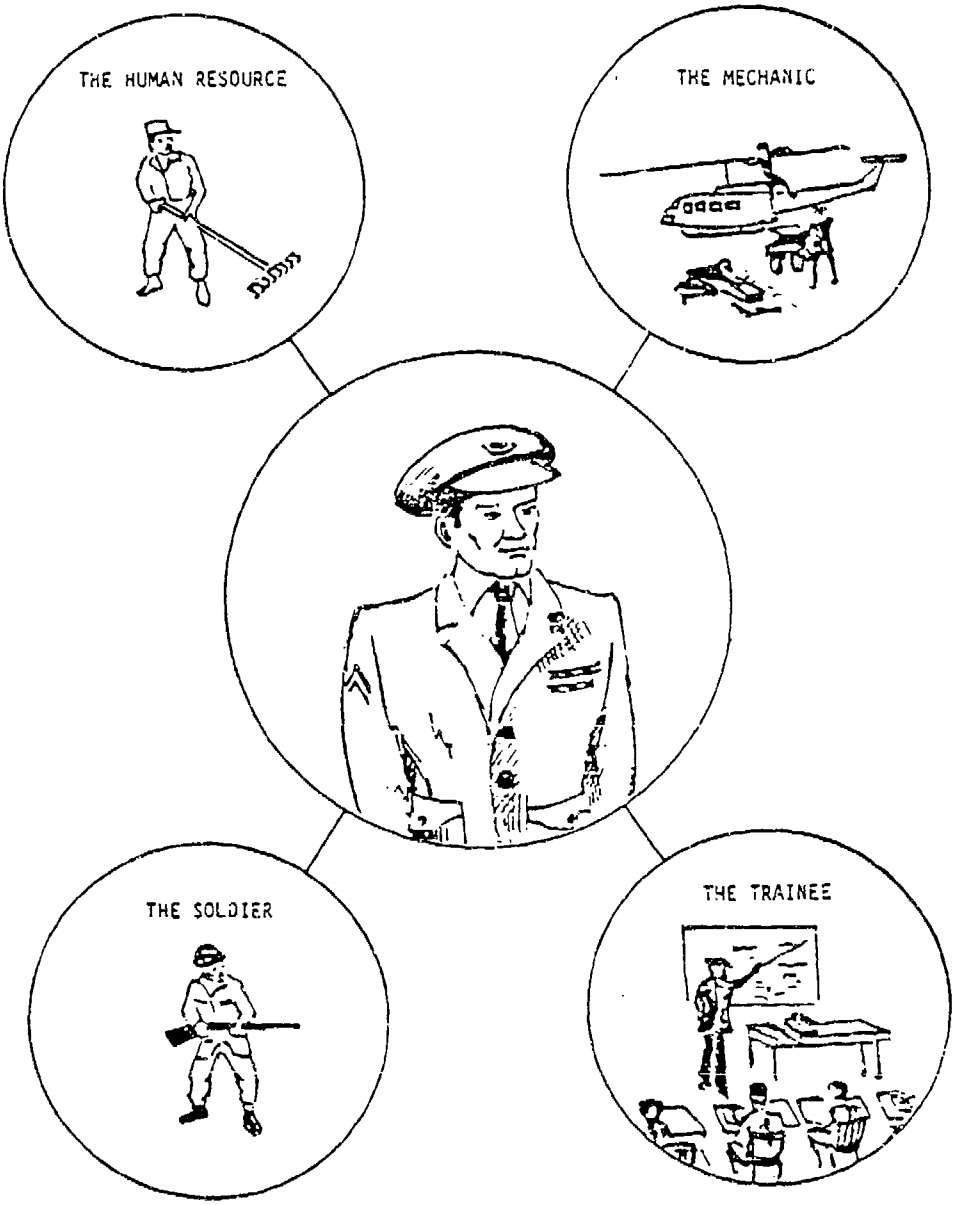


FIGURE 2-12.
THE U.S. ARMY AVIATION MECHANIC HAS MANY JOBS TO PERFORM
IN ADDITION TO HIS MILITARY OCCUPATIONAL SPECIALTY

Aside from the contextual variables that affect the system from outside the organization (i.e., not enough people signing up for military service), of which we have no control, there are areas within the organization that magnify the problem. For instance it was found that troops were interrupted from maintenance activities to perform non-maintenance activities in an unsystematic manner. In many instances, the first sergeant was not given adequate leadtime to produce an individual and when the individual left for a tasking, the first sergeant did not know how long the person would be gone. This resulted in people being abruptly taken off an ongoing maintenance job to perform a physically removed and unrelated job. Entered into the non-productive time is the maintenance start-up times, where a mechanic must collect his or her tools and leave, then upon return, display the tools and proceed with the maintenance task.

2.6.2 The Problem. The problem lies in scheduling those activities that disrupt maintenance activity in such a way so as to optimize effective performance in all tasks. The job analysis revealed that really only a handful of taskings adversely affected maintenance efficiency. Many of the taskings were of a group nature and did not disrupt maintenance activity, just halted it. There is an important distinction to be made here. The group taskings are usually soldier preparation tasks and play a large part in the soldiers overall training. Whereas, the taskings that disrupt maintenance intermittently are of the installation support type, such as mowing lawns, etc. These taskings usually require only a body (manpower) rather than a specific individual. Therefore, a method was needed to schedule individuals for these kinds of taskings which could be performed by anyone. To address this problem, a basic review of the allocation theories were reviewed in order to find a scheduling model to fit our needs.

2.7 Activity Scheduling Theories: A Review

Scheduling algorithms, or commonly referred to as allocation models are used to solve problems of two major types: (1) cases where there are a number of number of activities to be performed and there are alternative ways of doing them, and (2) cases where resources or facilities are not available for performing each activity in the most effective way. The objective is to combine activities and resources in such a way as to maximize overall effectiveness. There are various methodologies used to deal with these problems and will be discussed separately below.

2.8 Linear Programming Models

These models use several techniques for solving a general class of optimization problems dealing with the interaction of many variables subject to certain restraining conditions. Some programs strive to maximize gain while others focus on minimizing costs. Among these techniques are the Transportation Technique, the Simplex Technique and the Assignment Problem.

2.8.1 Transporation Technique. Basically the technique starts at obtaining a feasible solution, then evaluates alternative possibilities, and iteratively proceeds toward an optimum solution using simple arithmetic operations.

2.8.2 Simplex Technique. This technique which involves difficult mathematical operations which are applicable to problems of optimizing a linear function subject to restrictions which are in the form of linear inequalities.

2.8.3 Assignment Problem. Given n facilities and n jobs, and given the effectiveness of each facility for each job, this technique assigns each

facility to one and only one job in such a manner that the given measure of effectiveness is optimized.

2.9 Waiting-Time Models

A waiting-time problem arises when either units requiring service or the facilities which are available for providing services stand idle. Two models dealing with this problem are Queuing Theory and a Sequencing Model.

2.9.1 Queuing Theory. Problems of waiting time fall into two different types depending on their structure. The first type of problem involves arrivals which are randomly spaced and/or service time of random duration. This class of problems includes situations requiring either determination of the optimal number of service facilities or the optimal arrival rate, or both. A queuing model requires the following information: (1) the manner in which units arrive and become part of the waiting line, (2) the number of service units operating on the units requiring service, (3) the order in which units operating on the units, require service, and (4) the service provided and its duration. In addition to having knowledge of these four areas of information, the construction of models of waiting time processes usually involves relatively complex mathematics, and usually requires Monte Carlo procedures for a solution. The objective of the queuing model is to obtain an optimum balance between the costs associated with waiting time and idle time.

2.9.2 Sequencing Models. Sequencing models addresses the problem in which facilities are fixed and arrivals and/or the sequence of servicing the waiting customers are subject to control. The problem is to schedule arrival or sequence the jobs to be done so that the sum of the pertinent costs is minimized. Scheduling is used here to refer to the the timing of arrival of units requiring service. Sequencing is used here to refer to

the order in which units requiring service are serviced. Relatively little progress has been made on the sequencing problem because it is concerned only with minimizing some function of time and research has not addressed the problem of balancing conflicting objectives. Yet these problems exist in real world situations. One of the classical problems addressed by the sequencing model has been the "Traveling Salesman" problem.

2.10 Selection of a Scheduling Approach

2.10.1 Non-Applicability of Theoretical Models. Just a cursory review of the existing methods for allocation was sufficient to indicate that the characteristics of the system described by the job analysis fail to satisfy the necessary conditions. For instance, to be able to reach an optimal programming decision, all possible combinations of the operation must be known and must be able to be considered simultaneously (Churchman, et al, 1957). The data show that for a period of a month, many requirements are not known about, at least at the execution level.

In addition, the relationship between the amount of leadtime, and the amount of tasktime is clearly non-linear. This violation of linearity renders the techniques of linear programming models non-acceptable.

Of the four conditions required to use a queuing model, not one of them were met. There was no systematic knowledge concerning how many requests for taskings there were at any given time, nor were there day-by-day predictions of how many people were available to perform those takings. Also, the order which the requests for taskings was not known. The maintenance service provided is known, but the duration of the service for taskings vary.

The magnitude of the scheduling problem becomes horrendous when considering a sequencing model. There were 33 different taskings reported by the task demands form with three different units performing these activities. For ease of discussion, an example from Churchman, et al (1957), is submitted to show the combinatorial problem. Consider a problem involving the sequencing of 20 jobs on one facility. There can be 20! (2.5×10^{18}) different sequences. A fast electronic computer programming one sequence per microsecond and working 8 hours a day, 365 days a year, would take almost a quarter of a million years to find the solution. In addition, the sequencing model only considers the problem of minimizing a time function and does not take into account a major factor in military systems concerning conflicting objectives.

Based on the constraints of the system, a new scheduling method would have to be flexible. Flexible in the sense that it would be able to adapt to the demand responsive system which has variable peak demands. Since none of the theoretical scheduling models could be applied, the system was re-evaluated in terms of how the existing scheduling method could be used more effectively. The present system for allocating manpower for non-maintenance activities (i.e., details) is based, more or less, on the "hey you" method. In other words, it is based on a supervisor finding the nearest and most available person or persons, depending on the particular demand characteristics of tasking. A method that could systematize the present method to provide a predictable manpower loss for the supervision, but meet the tasking demands, would be necessary. One approach that fits these criteria is the work pool method.

2.10.2 The Work Pool Method. The scheduling approach selected for performing non-maintenance detail type activities was the work pool approach. This involves a team of people selected from all the units involved to perform many of the disruptive and not unique taskings, allowing the rest of the personnel in the unit to perform the regular daily maintenance

without undue interruption. The work pool approach allows the same mechanic to work the entire day on aircraft maintenance and related activities, which increases the probability of finishing a task by the same person who started it. OJT should improve as a function of the training element in task completion and the availability of skilled personnel as an immediate source of job knowledge. The work pool method would not reduce all interruptions, only those details that are frequently tasked that any one person could perform. Therefore, if training requirements dictate that all personnel must qualify on a weapon system within 24 hours, maintenance would essentially shut down and all persons would satisfy the training directive.

Using a team of individuals to perform those kinds of taskings where the Army uses its available human resources, has the following attributes. First, a pool of individuals has the flexibility to give an immediate response to highly variable demands. The cost of this flexibility is a certain amount of idle time by work pool members. This cost, however, can be minimized by determining the optimal number of pool members. The mechanics of achieving the optimal number of people would be worked out during initial work pool system implementation. Secondly, no particular unit would be adversely affected by giving up people for work pool participation. Leadtime for producing an individual or individual would be on a weekly rotational basis. Supervisors could estimate the loss of one or two people at the beginning of a week, but would not be bothered to produce additional people for these kinds of taskings for the remainder of the week. Thirdly, the work pool system needs no continual supervision of an outside consultant, only the guidelines of how the system should operate.

Systematic scheduling of manpower to perform installation support types of activities has the potential of more effectively performing maintenance activities by reducing the disruptive impact of interruption with some additional benefits:

(1) Supervisors could know how many men are available to perform maintenance on a given day, enabling them to more efficiently manage their units.

(2) Task start-up times could be reduced, allowing more time for actual maintenance during the normal work day.

(3) Satisfaction and motivational aspects of job identify could increase by allowing job closure.

3. INTERVENTION

3.1 Overview

The first year's program was aimed at assessing the effect of certain organizational variables on maintenance performance. Emphasis was placed on how current incentives and disincentives operating in the military maintenance environment promoted or deterred from efficient and effective maintenance practices. To achieve this aim, we used an integrated approach composed of system observation, semi-structured interviews, and diagnostic questionnaires. This provided a funneling effect for identifying specific problem areas in order to generate recommendations and guidelines for system improvement. Based on the data obtained from this diagnostic approach, an intervention was formulated to demonstrate how efficiency and effectiveness could be improved in an operational setting as a function of changing certain organizational processes. The intervention was based on an examination of the ongoing relationships taking place concerning one specific improvement area identified, namely activity scheduling. Within an experimental paradigm, organizational members learned a new scheduling method as a function of performing it. The underlying assumption was that successful performance of new, more efficient methods leads to attitude changes and, in turn, will reinforce the new, more efficient behaviors.

3.2 Approach

The approach involved a before-after type of design, where the implementation of the new scheduling method was preceded by a pre-test (baseline measures) and was followed by a post-test (evaluation of intervention). Data were taken continually throughout the intervention period, but were evaluated according to the pre-post design. For the

baseline period there was a continuation of the activity analysis similar to that of the job analysis, with revisions in the daily activity diary to focus specifically on primary job interruptions. Current levels of attitudinal measures such as job satisfaction, motivation, sufficient on-job-training, and reenlistment intention were assessed by questionnaire. Statistics describing objective measures of operational readiness rates and flight hours were assessed to determine current levels of maintenance performance.

3.2.1 Baseline Period. The baseline period lasted two weeks and took place from the 16th to the 27th of October, 1978. Daily taskings and daily activities documented during this period were compared with data obtained during the implementation period to evaluate the new scheduling method. First Sergeants reported the tasking requests they received each day during the baseline period. They documented the (1) source of requests, (2) nature of the taskings, and (3) personnel required to perform the tasking. A special data collection form was developed to assist them in documenting these data and to standardize the collection of data across first sergeants (see Appendix B2). Daily activiites of the troops were documented with the use of a daily diary (Appendix A2). The information obtained was (1) the amount of time spent in the primary job, (2) the amount of time given to on-the-job-training, and (3) the number of times troops were interrupted from their primary job to perform other activities.

The Perceptronics Job Survey (PJS)(Appendix C1) was used to assess biographical data, measures of job satisfaction, motivation, perceptions of training adequacy, and intention to reenlist. It was developed by incorporating the short form of the Job Descriptive Survey developed by Hackman and Oldham (1974), with questions about specific job perceptions. The JDS assesses the following ten job dimensions:

(1) Skill Variety. The degree to which a job requires a variety of different activities in carrying out the work, which involves the use of a number of different skills and talents of the employee.

(2) Task Identity. The degree to which the job requires completion of a "whole" and identifiable piece of work -- i.e., doing a job from beginning to end with a visible outcome.

(3) Task Significance. The degree to which the job has a substantial impact on the lives or work of other people -- whether in the immediate organization or in the external environment.

(4) Autonomy. The degree to which the job provides substantial freedom, independence, and discretion of the employee in scheduling the work and in determining the procedures to be used in carrying it out.

(5) Feedback from the Job. The degree to which carrying out the work activities required by the job results in the employee obtaining direct and clear information about the effectiveness of his or her performance.

(6) Feedback from Agents. The degree to which the employee receives clear information about his or her performance from supervisors or from co-workers.

(7) General Satisfaction. An overall measure of the degree to which the employee is satisfied and happy with the job.

(8) Internal Work Motivation. The degree to which the employee is self-motivated to perform effectively on the job.

(9) Satisfaction with Supervision. The degree to which an employee is satisfied with the work supervision and guidance in his job.

(10) Growth Satisfaction. The degree to which an employee is

satisfied with opportunities for personal growth and development while on the job.

In addition to the biographical section and the JDS items, Section 7 of the PJS contained 44 items dealing with job perceptions. Each item was logically classified into one of the following five generic types of job perceptions.

(1) Supervisor Effectiveness. The degree to which an employee feels his supervisor is effectively performing his job.
(2) Satisfaction with Scheduling. The degree to which an employee is satisfied with the method in which work activities are assigned.
(3) Unit Pride. The degree to which a worker is proud to be associated with his assigned unit.
(4) Job Satisfaction. The degree to which a worker is satisfied with his specific job duties.
(5) Satisfaction with the Organizational Structure and Communication. The degree to which a worker feels commands from the organization are effectively communicated to him.

3.2.2 Implementation. After the two week baseline data collection period, the new scheduling method was implemented. The implementation period continued for four weeks between 10 October to 27 November 1978. Troops continued to report their daily activities and work pool members began reporting their daily activities on a specially designed collection form (Appendix A3). First sergeants continued to report all taskings they received, but in addition, they also indicated the disposition of the taskings to the performing units or persons. For instance, a first sergeant indicated whether a tasking has handled by the work pool or was directed to the platoon.

A non-commissioned officer was assigned for the duration of the implementation period as the work pool supervisor. He interacted directly with the first sergeants and the command sergeant major (CSM) of the squardron and worked out what kinds of activities would be feasible for the pool to perform. Individuals serving on the work pool were selected by the first sergeant in conjunction with his platoon sergeants. Work pool members served for only one week, then they would go back to their respective unit and another individual would be selected. During that week, pool members reported directly to the work pool supervisor for duty each day. The work pool supervisor kept records on the nature of taskings and the number of persons required. In addition, he documented what platoons troops came from and their length of stay in the pool.

3.2.3 Evaluation. The evaluation portion of the implementation was essentially a repeat of the baseline measures with additional assessment measures to elicit perceptions of work pool effectiveness.

3.3 Survey Sample

Participants of the study were the 4th of the 9th Cavalry, 6th Air Cavalry Brigade, Fort Hood, Texas. The 4th of the 9th Cavalry is made up of Headquarters Troop, A Troop, and C Troop which consisted of about 500 people (see Figure 3-1). Selection of this organization was based on satisfying several criteria. First, they are a front line unit performing Organization Level maintenance. This type of organization was desirable because we believe that they can most benefit from the work pool system. The reason being that Direct Support level of maintenance organizations are looked upon as mechanics in that they are left alone more of the time than organization level of maintenance units in terms of performing other activities. It turns out that the front line units have to time-share between both soldier preparation and maintenance more frequently

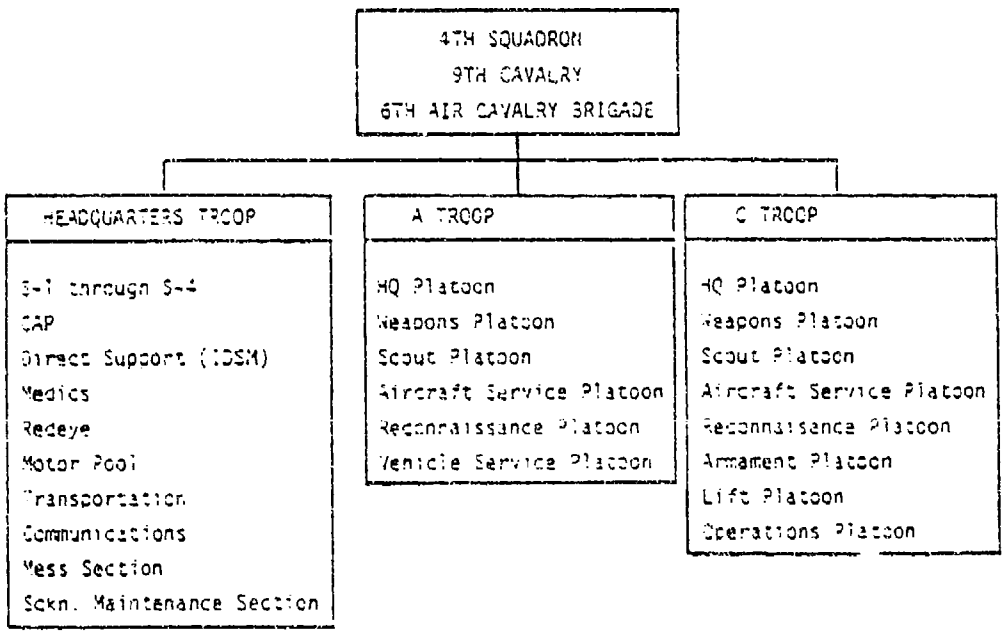


FIGURE 3-1.
BREAKDOWN OF THE MILITARY UNIT USED IN THE STUDY

than other units, and therefore could benefit from learning how to schedule both sets of activities in the most effective manner. Secondly, working with only one organization, with one chain of command, that was manageably sized, was a positive attribute. With the work pool being governed at the squadron level, potential problems could have arisen concerning inter-organization conflict. In addition, the pool would have become too large for one supervisor to handle effectively. The size of the entire organization was such that the study could be efficiently managed by the research team.

For the work pool method to function properly, it was necessary to include all Military Occupational Speciality's (MOS) within the units studied, rather than just the 67 and 68 series. The reason being that everyone would have to participate in the rotating work pool to achieve the full benefit of decreased interruptions on any one particular work function.

3.4 Representativeness of Intervention Time Frame

An assessment was made to determine how representative the block of time was that the intervention took place, as compared to another time period. The purpose was to find out if there were any differences between when the study was conducted and "normal" military operations. Operational Readiness Rates and flight hours of the eleven months prior to intervention were used as indicators. Operational Readiness rates over the period of a year gave an estimate of how effective the organization as a whole was in maintaining aircraft. These rates displayed as percentages also indicated the performance variability. Flying hours provided an estimate of potential maintenance workload and whether there was a disproportionate amount of workload for any given time period. The operational readiness rates for the period of January 1978 to November 1978 reveal very little variability as shown in Table (3-1). However, the number of hours flown, ranging from 203.5 hours to 1431.2 hours, shows a great deal of variability

TABLE 3-1

ORGANIZATIONAL PERFORMANCE MEASURES ELEVEN MONTHS PRIOR TO INTERVENTION (FROM D.A. FROM 1352)

MONTH (1978)	OPERATIONAL READINESS (%)	HOURS FLOWN
January	86	203.5
February	79	242.4
March	79	271.4
April	79	538.2
May	80	671.5
June	82	510.6
July	80	994.4
August	75	1431.2
September	74	1356.1
October	81	825.4
November	79	770.4
MEAN	79.45	710.46
S.D.	3.21	421.16
RANGE	74 to 86	203.5 to 1431.2

Correlation between OR and flight hours

$r = -.73$ (significant at .01)

from month to month. There is a significant negative correlation between operational readiness rates and the amount of flight hours. This indicates that the more hours that are flown, the lower the percent of aircraft are available for missions. The relationship has common sense value in that increased flight hours increases the need for maintenance. Increased maintenance requirements requires increased concentration on maintenance activities to achieve the same high levels of operational readiness rates. Flight hours per month increased almost linearly, as illustrated in Figure (3-2). The implication of this trend is that achieving the required amount of flight hours becomes more important as the fiscal year comes to a close, thus indicating a high maintenance load. This contention is supported by the fact that the number of flight hours reaches a peak during August. If the present study were conducted during the summer months, there might be reason be believe that the intervention was implemented at an unrepresentative time frame. The flight hours, however, fall off rapidly after August and return to a rate of military operation "normalcy." Given that the military operates in a constant state of fluctuation within liberal limits, to maintain flexibility, there is no reason to believe that the time period when the intervention took place was out of the normal.

3.5 Results of Questionnaire Data

Data were selected from respondents of the Perceptronics Job Survey only if respondents had completed the questionnaire at both the pre and post test administrations. The total sample of 96 male respondents were 23 years of age on the average, with 51 percent of them being married. Eighty-one percent of the respondents had at least a high school education, had been in the military for 2.5 years, and in this specific unit for over 10 months. When asked if they planned to reenlist in the Army, 31.2 percent answered yes, 53.2 percent answered no, and 15.6

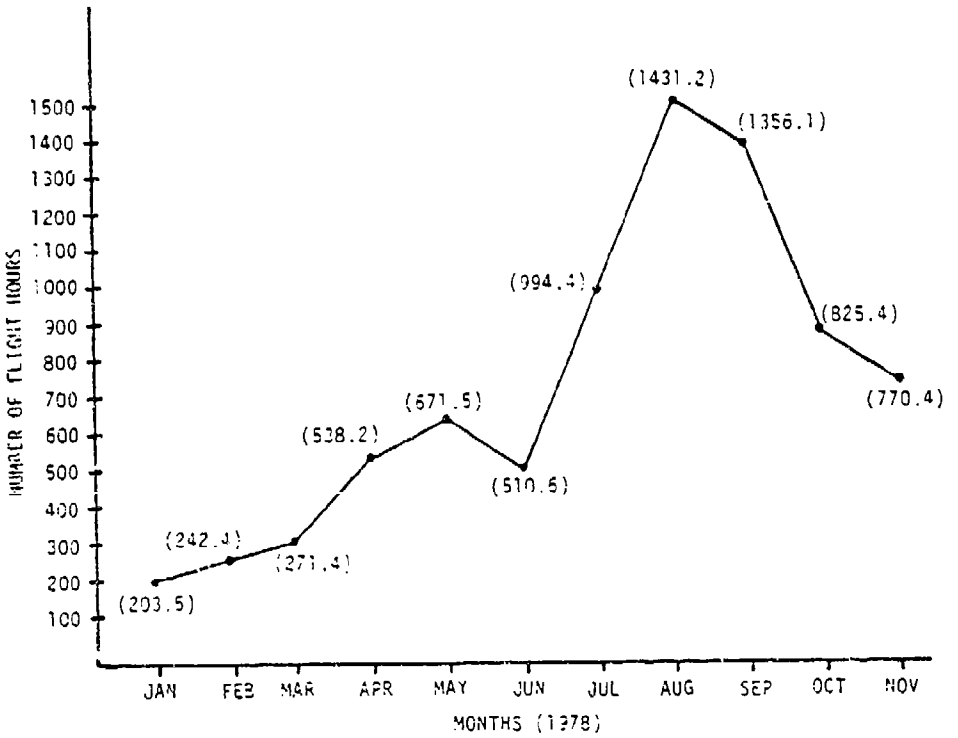


FIGURE 3-2.
THE AMOUNT OF FLIGHT HOURS PER MONTH FOR THE YEAR PRECEDING THE INTERVENTION

percent were undecided. Thirty-four percent of the subjects planned to make the Army their career, 52.5 percent indicated a preference for a career outside the Army, and 13.5 percent were undecided.

For purposes of analyses, data were categorized into two groups according to a soldier's rank, in order to reflect their enlistment status. The first group, composed of 37 respondents, were serving their second or subsequent enlistment. The remaining 59 respondents were classified into a second group and were serving their first enlistment in the Army. The results from each group were independently analyzed to assess different work perceptions as a function of more experience in the Army.

The second enlistment group exhibited attitude changes between the baseline and evaluation periods in five areas, while the first enlistment group had no statistically significant attitude changes due to the experimental intervention. The areas of attitude changes among the second enlistment group were statistically significant, but were of no functional value for this study. Therefore the data were collapsed and used to describe the overall attitudes of the participants in the study. There were two reasons for doing this. First, the two time periods were statistically compared using a T-test, which tends to increase the probability of obtaining significant effects when multiple comparisons are performed. Significance at the .05 level, with the high chance factor due to multiple comparisons, rendered the data suspect. Secondly, the implementation period, consisting of only four weeks, was enough time to make initial evaluations of the new scheduling method, but was not a long enough period to instill measurable attitude changes.

The average scores for both groups on the 10 different job dimensions and 5 job perceptions, assessed by the Perceptronics Job Survey are presented in Figure 3-3. Task significance and internal work motivation

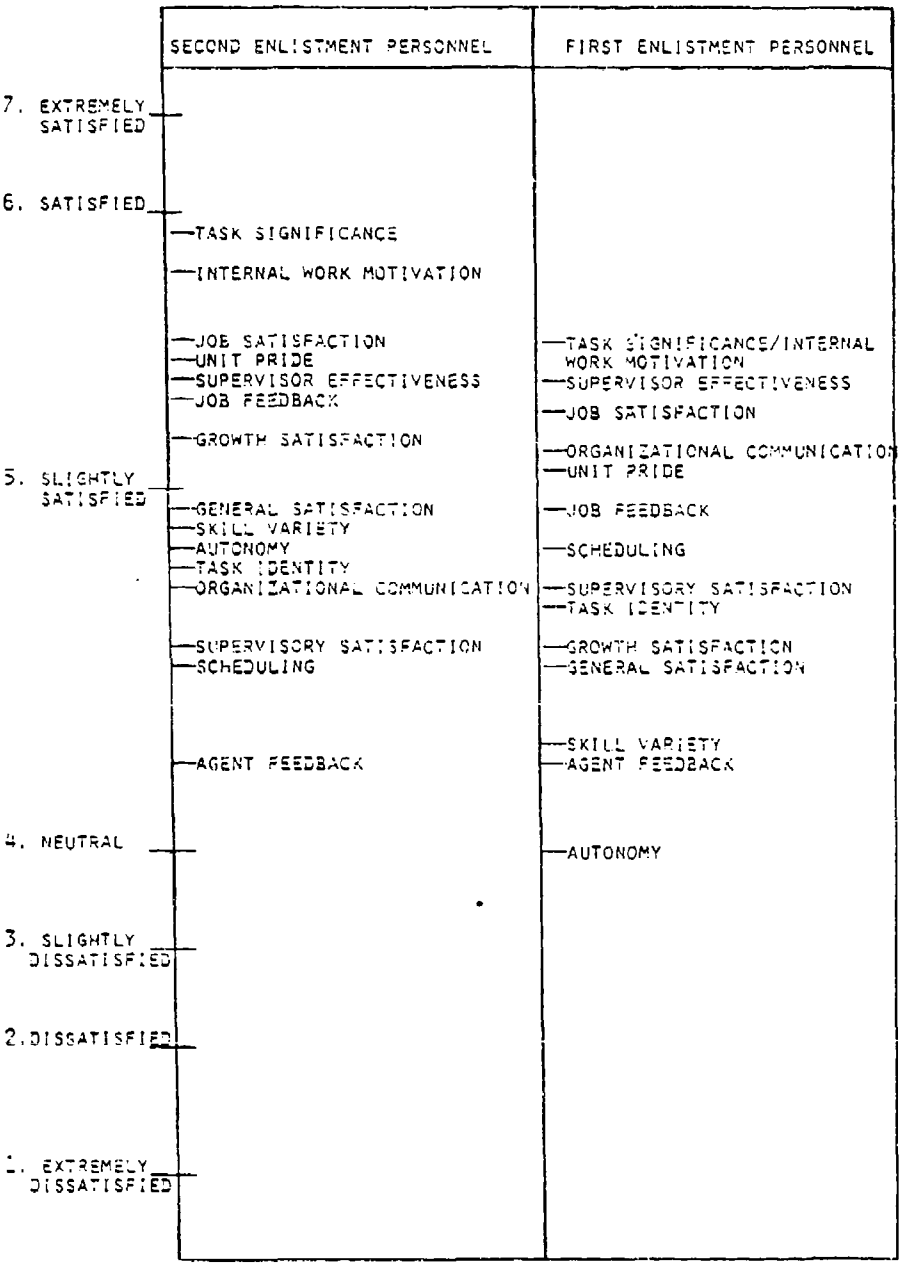


FIGURE 3-3.
ATTITUDES TOWARD WORK FOR SECOND ENLISTMENT AND FIRST ENLISTMENT PERSONNEL

were rated the highest by both groups. This indicated that Army personnel perceive their jobs as being important to the overall effectiveness of the organization, and possess a relatively high desire to perform their duties efficiently. Furthermore, both groups indicated similar job perceptions in the areas of task identity, feedback from agents, supervisory satisfaction, supervisor effectiveness, unit pride, and job satisfaction. This suggests a general satisfaction with both work supervision in the Army and the specific job duties for which a worker is responsible.

First enlistment respondents had slightly higher scores for satisfaction with scheduling procedures, and with the organizational structure and communication. This may be explained by the fact that in general, these respondents have a smaller variety of work duties when compared with second enlistment subjects. Their duties also have a smaller degree of decision making and autonomous action. For these reasons, first enlistment subjects may be more satisfied with scheduling and organizational structure because responsibilities are assigned to them by higher ranking personnel in the organization. They are not responsible for making major decisions, but are instead responsible for performing specific operations.

Second enlistment respondents displayed relatively higher ratings in skill variety, autonomy, feedback from the job, general satisfaction, and growth satisfaction. These results support the contention that because second enlistment subjects have more experience in the Army and a higher rank status, they have somewhat different job perceptions from first enlistment subjects. They have a vested interest in the Army and feel their job is highly related to the success of the overall military organization. In general, they possess a greater variety of work duties, have substantially more freedom and independence in their jobs, and

receive more feedback about their work performance. As a consequence, they are more satisfied with the opportunities for personal growth and development while on the job, and have a higher degree of overall satisfaction.

3.5.1 Work Pool Evaluation Questionnaire. A Work Pool Evaluation Questionnaire was designed to directly assess attitudes toward the work pool scheduling approach. This five question form was administered to 134 troops to establish whether a person had been assigned to the work pool, and also assessed attitudes about the work pool system (Appendix C2). The obtained scores were based on a five-point scale with one point indicating agreement to a "very little extent;" two points, agreement to a "little extent;" three points, agreement to "some extent;" four points, agreement to a "great extent;" and five points indicating agreement to a "very great extent."

The responses to the Work Pool Evaluation Questionnaire are presented in Table 3-2. In general, there were overall positive attitudes toward the work pool approach. Over half the respondents indicated from some extent to a very great extent, they perceived primary job interruptions had decreased since the work pool was implemented. Over 60 percent liked the pool system for scheduling non-primary MOS activities. An impressive 70.8 percent of the respondents felt that, regardless of their personal feelings toward the work pool, it was an effective method of assigning individuals to non-maintenance work tasks. The final question asked whether the work pool system should be continued in the Army. Two-thirds of the respondents indicated from some extent to a very great extent, that the pool approach should be retained as part of normal military operations.

Due to an implementation period of only four weeks, not all the troops participated in the work pool. The answers for pool participants and

TABLE 3-2

THE PERCENTAGE OF RESPONSES BY TROOPS RELATING TO WHAT EXTENT THEY EVALUATED CERTAIN WORK POOL EVALUATION MEASURES

QUESTIONS	VERY LITTLE EXTENT	LITTLE EXTENT	SOME EXTENT	GREAT EXTENT	VERY GREAT EXTENT
To what extent has the amount of primary job interruptions decreased since the work pool system began?	24.6%	23.9%	37.3%	9.7%	4.5%
				51.5%	
To what extent did the work pool system directly affect you?	35.1%	22.4%	24.6%	14.2%	3.7%
				42.5%	
To what extent did you like the work pool system for scheduling manpower to work details?	20.1%	18.7%	29.1%	23.1%	9.0%
				61.2%	
To what extent do you feel the work pool system is an effective method of assigning individuals to work tasks even though you may not personally like it?	17.2%	11.9%	37.3%	23.1%	10.4%
				70.8%	
To what extent do you feel the idea of a work pool system should be continued?	19.4%	14.2%	19.4%	26.9%	20.1%
				66.4%	

non-pool participants were averaged separately to assess whether assignment to the pool would create different perceptions. The results of this analysis are presented in Figure 3-4. The only statistical difference between the two groups were that pool participants felt more directly affected by the pool system. This is not surprising since these individuals had an opportunity to directly participate in the system. Both groups indicated similar perceptions toward reductions in primary MOS related work interruptions, personal preference with the pool approach, satisfaction with the pool approach as a manpower scheduling device, and the continuation of the work pool concept in the military setting. The results are especially encouraging because they indicate the positive impact which the work pool approach had, and points toward this type of system as a viable organization incentive for greater work satisfaction and system efficiency.

3.6 Tasking Analysis

First Sergeants documented all taskings that occurred during the intervention including such information as the source, the type, and the disposition of the taskings. The data indicated that there were five different sources that requested manpower from the troop level during the study. These sources included: (1) the Troop First Sergeant, (2) the Squadron Command Sergeant Major (CSM), (3) the Troop supply sergeant, (4) the Squadron Operations Office (S3), and (5) the Brigade level. The tasking source and the types of activities performed are displayed in Table 3-3.

It turned out that during the time period in which the intervention took place, 64 percent of the taskings for non-maintenance activities were initiated at the troop level by the first sergeants. These activities involved policing trash and cigarette butts around the

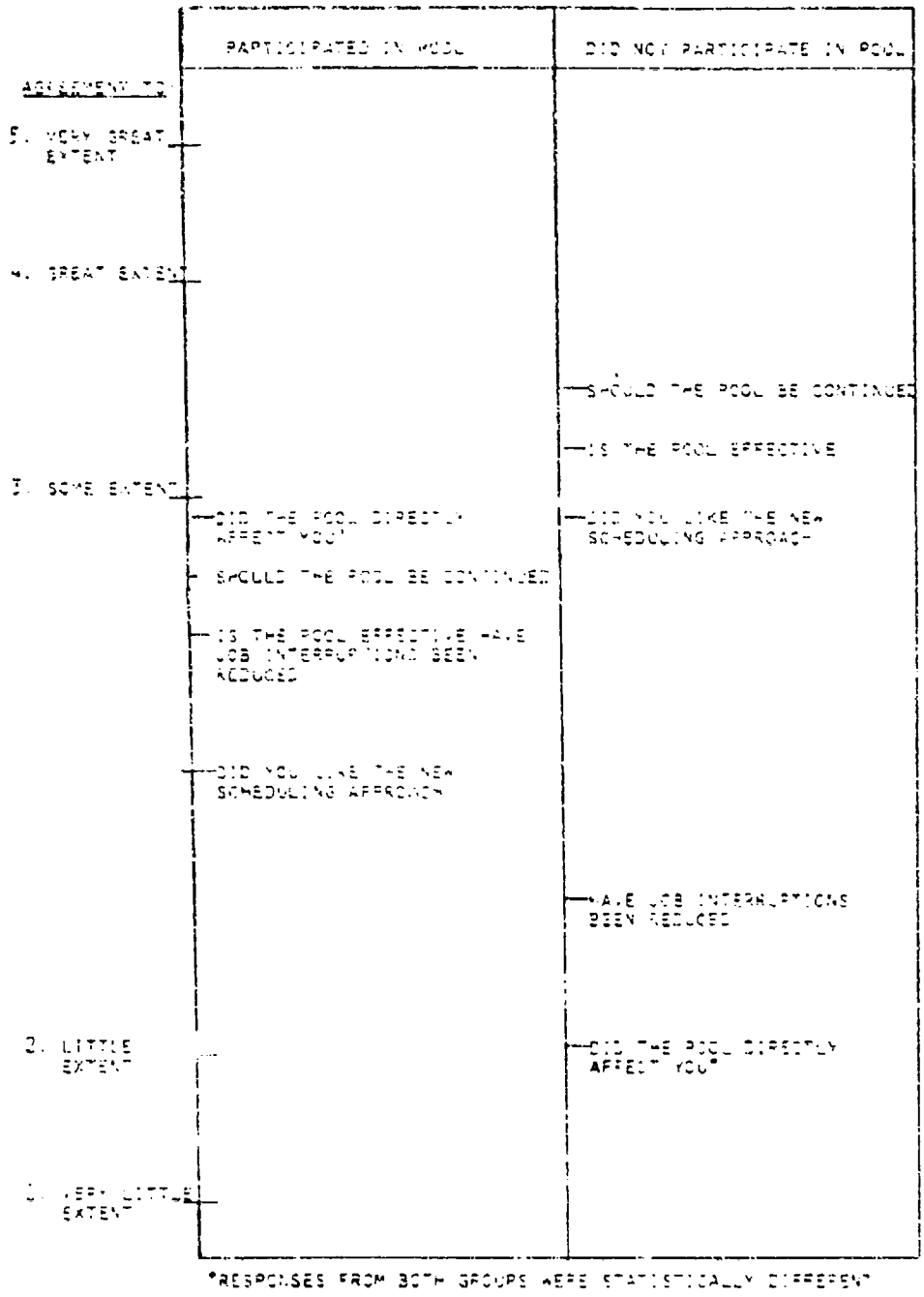


FIGURE 3-4.
EVALUATION OF THE WORK POOL SYSTEM AS A FUNCTION OF WORK POOL PARTICIPATION

TABLE 3-3

THE KINDS OF ACTIVITIES PERFORMED AND
THE SOURCES OF TASKING REQUESTS

TASKING SOURCE	PERCENT OF TIMES TASKINGS OCCURRED DURING MONTH (N=58)	PROPORTION OF TIMES TASKINGS WERE PERFORMED BY SOCL	PROPORTION OF TIMES TASKINGS WERE PERFORMED BY PLATOON
FIRST SERGEANT	64%	21%	79%
Policing Detail	29%	00%	100%
Painting Detail	5%	100%	00%
Clean-up Arms Room	2%	00%	100%
Clean Laundry	2%	00%	100%
Clean Orderly Room	2%	00%	100%
Clean Day Room	19%	45%	55%
Barracks Guard	5%	00%	100%
COMMAND SERGEANT MAJOR	17%	86%	14%
Painting Detail	7%	100%	00%
Specific Area Policing	2%	100%	00%
Clean Classroom	2%	100%	00%
Construct Fence	2%	100%	00%
Scrap Papers	2%	100%	00%
Cut Grass	2%	100%	00%
Color Guard	2%	00%	100%
SUPPLY SERGEANT	7%	67%	33%
Clean Equipment	3%	00%	100%
Clean Tents	3%	100%	00%
Move Equipment	2%	100%	00%
SQUADRON OPERATIONS	10%	100%	00%
Parade Support	10%	100%	00%
BRIGADE	2%	100%	00%
Distribute Ft Hood Paper	2%	100%	00%

troop area, painting details, various cleaning jobs, and guard duty that was not roster regulated. CSM generated non-maintenance activities involved 17 percent of the total taskings and were of the same general nature of the first sergeants taskings. Activities generated by the troop supply sergeant involved 7 percent of the taskings and involved activities concerning equipment maintainability. Squadron operations and Brigade level taskings accounted for 10 percent and 2 percent of the total taskings respectively, and included installation support type activities.

The tasking data revealed that many of the first sergeant details were not performed by the work pool, whereas all other activities from the remaining tasking sources were highly amenable to performance by the work pool. In fact, for the tasking sources other than the first sergeant, there were only two activities the work pool did not perform. These activities were cleaning of equipment and color guard, which required specific inviduals. The Army requires soldiers to clean their own individual equipment especially in the case of weapons. Persons participating in color guard, train to work together as a team. Of those details originating from the first sergeant himself, only two particular activities were performed by the pool. These two activities were painting, of which the work pool performed 100 percent of the time, and cleaning the barracks day room, of which the pool performed this activitity 45 percent of the time. Superficially, it appears that the types of activities falling under the first sergeant category, involving policing, painting, cleaning, and guarding, could have the potential to be performed by the work pool. There are extenuating circumstances, however, which explain why those activities were not allocated to the work pool. For instance, area policing occurs every work morning at the same time the troops are gathered for morning formation and inspection. Since all the troops are available

it only requires a few minutes to police the entire area of responsibility before dispursing to individual work areas. The cleaning activities from the first sergeant are many times assigned back to the platoon because individuals within the platoon should have cleaned these areas immediately after use and failed to. Therefore, the first sergeant many times finds himself performing a parental role. Barracks guard is not an ongoing assignment and only occurs in special circumstances. For instance, a situation might occur where the contents of soldier's room locker needs to be inventoried and guarded for various UCMJ reasons. The first sergeant in this case would select an NCO level person that he personally trusts, rather than allocating this task to a work pool member he does not know.

Inferring from the taskings that were reported during the intervention period, the data overwhelming suggests that most of the non-maintenance type activities that require human resource support from aircraft maintenance units, can be performed by a work pool.

3.7 Daily Activity Analysis

Only subjects who completed Daily Activity Diaries for 60 percent of the experimental period were used in the analysis. This technique was used to assess trends in work activities by utilizing the same subjects throughout the evaluation. In order to evaluate the impact of the work pool approach on primary job interruptions, data for a given work day were only analyzed if the subject performed his primary MOS job or on-the-job-training activities. This was done to prevent distortions in the data. Persons assigned to field exercises would not be exposed to the type of work interruptions focused upon in this study. For this reason these subjects were eliminated from the analysis. A total of 142 subjects were used in this portion of the evaluation.

Work interruptions were defined as either soldier preparation activities or other activities which occurred during the time in which a worker performed primary MOS job activities. Soldier Preparation activities are those duties performed to maintain a person as part of the defense force. Examples of these types of activities include firing range, guard duty, motor stables, and mission support. Other activities refer to those activities which were performed during normal working hours that were not related to a person's primary MOS or soldier preparation activities. Area beautification, barracks inspection, mowing the lawn, are just some examples of the duties performed in the Other Activities category. Work interruptions caused by either of the above activities would cause a worker to leave, and delay completion of, the assigned maintenance activity.

The percentage of personnel who were interrupted from their primary job by soldier preparation activities is illustrated in Figure 3-5. These kinds of activities involve tasks that require specific individuals to perform in order to maintain a state of combat readiness for each person. Therefore, weekly fluctuations in the amount of interruptions on maintenance activity is not a function of the work pool influence, it is dependent on the scheduling of military training in high levels of command beyond the control of this intervention. During weeks three and four of the intervention, nearly one-fourth of the workforce was interrupted. This event may be explained by the occurrence of an IG (inspection) during week three and a EQRE (field exercises) during week four. Soldier preparation activities many times are on a larger scale in terms of the required manpower, and may take all the individuals in a unit for a weeks time, but may not interrupt the unit at all during another week.

The work pool approach mainly affected interruptions in which specific individuals were not needed to perform a work task. These work

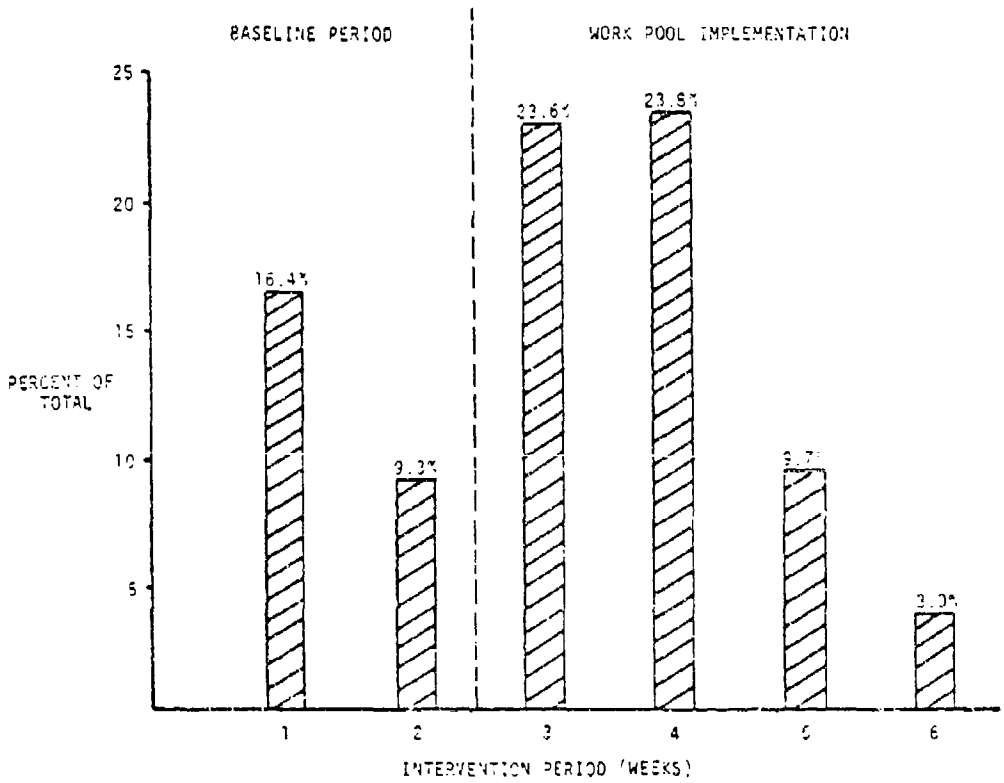


FIGURE 3-5.
PERCENT OF WORK FORCE INTERRUPTED FROM THEIR PRIMARY MOS JOB DUE TO SOLDIER PREPARATION ACTIVITIES

interruptions were labeled Other Activities. The percent of the total sample who were interrupted from their primary MOS job activities by Other Activities is illustrated in Figure 3-6. During two week baseline period the average of interruptions was 21.75. With the implementation of the work pool system, there were systematic decreases in work interruptions. Beginning with an initial value of 26.2 percent there was a significant decrease in work interruptions during the second week of implementation to 15.6 percent. This was followed by a slight increase during the third week of the work pool implementation to 17.7 percent, but decreased to 8.3 percent during the fourth week of the implementation. There was a total reduction of 17.9 percent of the sampled population who were interrupted from their job activities.

Further results from the Daily Activity Diaries indicated an increase in the proportion of the work day spent performing primary work activities. Table 3-4 presents the average length of a work day, and the percent of total time and average hours spent performing primary job activities, soldier preparation activities, and "other activities." Values for on-the-job-training activities are not presented due to the low frequency of their occurrence during the period in which the study was conducted. Although there are minimal changes in the amount of hours spent performing primary job activities, there are significant increases in the proportion of the work day in which primary job duties were conducted. Baseline values of 79.8 percent and 81.6 percent, when compared with the percentage obtained at the end of the evaluation period (91.2 percent), indicated increases in the proportion of time spent on primary job activities of 11.4 percent and 9.6 percent respectively. Consistent with the reduction in both types of work interruptions presented earlier, there were also reductions in soldier preparation activities and "other activities." By decreasing the occurrence of other activities the worker was able to

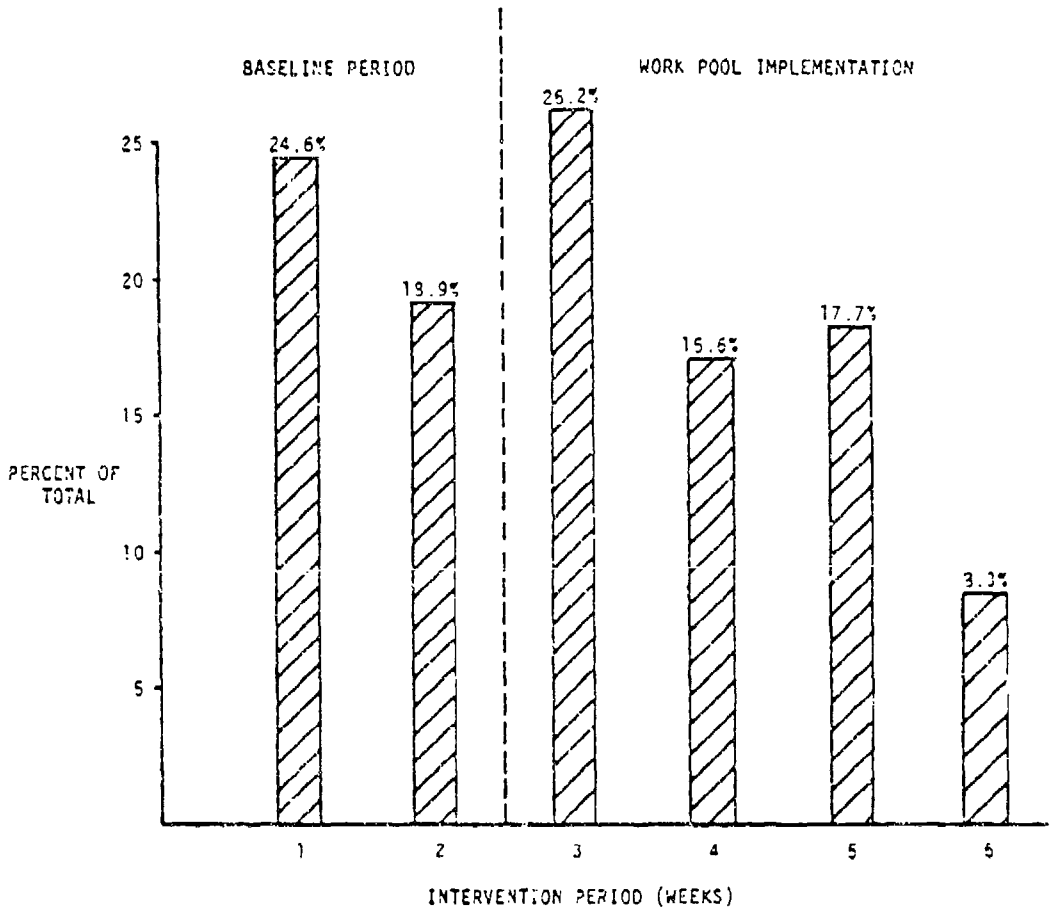


FIGURE 3-6.
PERCENT OF WORK FORCE INTERRUPTED FROM THEIR PRIMARY MOS JOB ACTIVITIES DUE TO "OTHER ACTIVITIES"

TABLE 3-4

THE AMOUNT OF TIME TROOPS SPENT IN EACH ACTIVITY CATEGORY

PERIOD	WORK WEEK	AVERAGE WORK DAY (HOURS)	PRIMARY JOB		SOLDIER PREP.		OTHER ACTIVITIES	
			HRS/MAN	% OF DAY	HRS/MAN	% OF DAY	HRS/MAN	% OF DAY
BASELINE	1	9.44	7.53	79.8%	0.87	9.2%	1.04	11.0%
	2	10.22	8.43	81.6%	0.58	5.7%	1.35	13.2%
	3	9.96	7.51	75.4%	0.94	9.4%	1.51	15.2%
	4	9.53	7.55	79.2%	0.90	9.4%	1.08	11.3%
WORK TOOL INTERVENTION	5	9.58	7.70	80.6%	0.77	8.0%	1.11	11.6%
	6	9.16	8.35	91.2%	0.23	2.5%	0.40	4.4%

spend a greater proportion of his time on his primary job. The work pool system accomplished this by assigning a few individuals to perform other activities thereby allowing the remaining workers to focus on the performance of their primary tasks.

3.7.1 Work Pool Activity Analysis. To document the activities of work pool personnel, Activity Diaries were distributed on a daily basis to the pool participants. An average of five persons per day were assigned to the work pool, with each worker assigned to the pool for an average of three days. The results of the Activity Analysis for work pool personnel are presented in Table 3-5. These results indicated that 81.73 percent of the average work day was spent performing work pool taskings. The remaining part of the day, 17.38 percent was spent awaiting assignment to work details. The work pool supervisor indicated that during this period of awaiting assignment to work details, the pool personnel were kept busy by performing other duties. In some cases the pool supervisor was able to assign workers to tasks on his own initiative that had not been directly assigned to the pool. These activities would have eventually be tasked, but had not reached a priority status. By performing these tasks "ahead of time," the work pool was able to reduce future tasking load. During awaiting task assignment periods, many pool members spent their time studying their Skill Qualification Test (SQT) manuals. This provided the workers the opportunity, to study required job knowledge text material. In this way the idle time necessary maintain flexibility for rapid response to tasking requests was used effectively for training.

3.8 Work Pool Evaluation Interviews

3.8.1 First Sergeants Interview. All three First Sergeants and the work pool NCO were gathered around a conference table and a semi-structured

TABLE 3-5

RESULTS OF THE ACTIVITY ANALYSIS FOR WORK POOL PERSONNEL

WORK WEEK	AVERAGE WORK DAY (HOURS)	PERFORMING ASSIGNED TASK		AWAITING ASSIGNMENT		PERSONAL AFFAIRS	
		HRS/MAN	% OF TIME	HRS/MAN	% OF TIME	HRS/MAN	% OF TIME
1	8.74	7.48	85.56%	1.00	11.43%	0.26	2.90% *
2	7.36	5.61	76.19%	1.75	23.76%	----	----
3	8.43	7.47	88.60%	0.97	11.46%	----	----
4	6.54	4.85	74.18%	1.69	25.82%	----	----
AVERAGE FOR ALL WEEKS	7.77	6.35	81.73%	1.35	17.38%	0.06	0.77%

* one occurance during entire intervention period

interview was held to evaluate the work pool system. The reason for the group interview was to foster similar interactions that took place during the pool period in order to elicit the kinds of problems that may have occurred. Also, the group interview was good in promoting conversation by members stimulating ideas or experiences other members could relat to. The interview was very positive and productive. First Sergeants expressed their praise concerning the simplicity, but high effectiveness of the work pool system. The following paragraphs discuss the topic areas covered by the interview.

Managing Manpower. First Sergeants indicated that they liked knowing the location of individuals that were on taskings. Normally, when a man was taken the First Sergeant lost contact with that individual. The First Sergeant knowing that this man would be gone for an entire week, could plan around him accepting the fact that he would be gone for that time period. But for some reason if a specific person was needed, the First Sergeant had the option to replace that person in the pool and use him for a particular task.

Responsiveness of Work Pool. First Sergeants remarked that due to the work pool they were able to be more responsive to tasking requests. Before the pool, a First Sergeant would have to call down from the orderly room to the flightline (the two locations are physically removed) and try to locate an individual to perform the tasking. He would have to go down the chain of command (First Sergeant, Platoon Sergeant, Team Leader) to find someone who was not performing a critical task. The tasking would go through several hands and take a lot of time. With the pool, the First Sergeant would make only one phone call to the work pool NCO and the NCO would respond immediately.

Work Pool Flexibility. The point of down time of pool personnel came up in the discussion. Downtime being that time where no taskings were given and personnel were sitting with nothing to do. It turned out to be a discussion of the trade-offs between responsiveness of the work pool to perform taskings and downtime periods where no activity occurred. The general concensus favored the flexibility of the pool to be responsive to the tasking demands as long as the soldiers were doing something constructive during that down time. As it turned out, many work pool members were studying their skill Qualification Manual during the slack periods. This concept was further developed to the extent that this time could be used as an addition to regular training in many content areas. For those individuals with reading problems, tape recordings of training materials could be made available. Therefore, the downtime to maintain responsiveness of the work pool to taskings would be converted into productive time for the individual soldier.

Work Pool Initiation. The work pool NCO remarked that Mondays for him were difficult days in terms of initiating the incoming work pool members. He had to explain that the work pool was not just another detail they had to perform, but it was a new system to reduce constant interruptions of primary MOS work activities. As the week progressed work pool members indicated that they did not mind working in the pool for a week because they realized they would not be bothered again until every one else had the chance to be a work pool participant. The revolve around time is a function of the size of the units involved. In this particular case, where there was a large amount of people and only four weeks of pool operation, only a small sample of people were utilized for the pool.

Poolable Taskings. Whether or not a task was considered a poolable task was determined by the time required to perform the task. If a particular task would take longer than a week it was not considered poolable. If a

particular task would take longer than a week it was not considered poolable. If a tasking required taking people far away from the local area it was not considered poolable. The most important criterion was the tasking had to be something that anyone could perform. Within these boundaries there was only one incidence where a tasking was refused. A tasking request came to the pool to put up a bulletin board up in an orderly room. The pool NCO said that a CQ was sitting in the room with nothing more to do than answer the telephone and that he should install the bulletin board since it required only pounding in two nails. In other instances, it was found that many taskings previously done by the "hey you" method were performed much more efficently by the pool. For instance distributing the Fort Hood newspaper used to take a good part of the day by the time a task team was formulated. With the pool, a team of individuals were already assembled with proper supervision and the task was completed in early morning. Many tasks were initiated and completed by the pool iteself resulting in accomplishing a task before it became an issue. This case is exemplified by the painting of skid pads on the flightline. Not only did the work pool complete this task much faster tha it normally is done, but it saved other people from having to do it for the upcoming Inspector General inspection. Due to the work pool there were less things to prepare for resulting in less time for other organizational members away from their primary job. One other example of a tasking performed by the pool was that of parade preparation. Pool members would mow the lawns, set up seating, and assist communications people with the public address system.

Implementation Difficulty. The First Sergeants were asked how difficult the system was to implement. They confessed in the beginning they perceived it was going to be very difficult to work with and, in fact, kept looking for potential problems. Once the system got under way, they realized how useful it was to go through only one person to handle

tasking requests. They indicated that after a system like this one has been in operation for a period of time many of the agencies that require manpower would go directly to the work pool rather than going through the First Sergeants.

3.8.2 Platoon Sergeants' Interview. Platoon Sergenats were also assembled in order to obtain some feedback about the work pool approach. Interviews were held at this level because the Platoon Sergeants were in direct contact with the workders during the experimental intervention and may have had a different perspective than the first sergeants. Many of the comments provided by the Platoon Sergeants were previously addressed by the First Sergeants, however some additional issues were identified and discussed. A summary of these issues is presented below.

Work Force Control. Platoon Sergeants indicated that the work pool system enabled them to have greater control over the men in their platoon. Initially they indicated that being without the services of any worker is undesirable, however after becoming familar with the work pool approach, they found that they could maintain more control over their platoon members. They knew in advance that a specific worker would be at the work pool, and they could make compensations within their platton to lessen the impact of his absence. If a specific individual was needed to perform a specific platton related task, but was presently a pool member, platoon sergeants had the option to send a replacement to the work pool so that the specific individual could return to the platoon. On previous occasions, a worker who was assigned to a work detail returned only upon the completion of that task. Under that system, his services would be lost from the platoon for the duration of the work detail, or longer, and the Platoon Sergeant had less control over his work force.

It was also mentioned that the work pool allowed Platoon Sergeants to improve the efficiency of their work force by concentrating on a worker who requried remedial training. By having control over who is assigned to the work pool, the Platoon Sergeants could retain a worker who needed more on-the-job training. This would enable the worker to stay in the service area and receive additional training time, thereby improving job skills.

Job Interruptions. One of the recurring themes in the interviews, was the aspect of decreased interruptions of the Platoon Sergeants to produce individuals for non-maintenance taskings. Before the work pool implementation, they were called upon to furnish a worker to do non-primary MOS job activity. They would have to select an individual, give him the work assignment, then compensate for the loss of the individual in the platoon. These interruptions were random occurrences and many times the interruptions came at critical moments in the day. With the work pool system available, Platoon Sergeants usually were asked for one individual at the end of a week to serve as a work pool member for the following week. After that, Platoon Sergeants were out of its tasking loop. Tasking requests would then go directly to the pool supervisor, thus allowing the Platoon Sergeants to experience less job interruptions.

Personnel Reactions. When questioned about the platoon members' attitude toward being assigned to work pool, Platoon Sergenats indicated that the work pool system allowed a worker to complete tasks more often. Workers did not have to leave the platoon to perform work details, and this increased their work satisfaction. Furthermore, the Platoon Sergeants related that when workers returned from the work pool they appeared to be "ready" to work. The platoon members knew that they would be assigned to the work pool for a period of time, but when they returned they would not be interrupted while performing their primary job.

Implementing the Work Pool System into the Military. The Platoon Sergeants were asked whether they felt the work pool system should be continued in the Army, and what changes they would make to improve the system. They unanimously indicated that the work pool should be continued as a method for assigning men to work details. Their main reasons were: (1) the work pool system enabled greater control over the platoon members; (2) it facilitated the scheduling of job activities; (3) it reduced job interruptions for both platoon members and Platoon Sergeants; and (4) it was easy to implement and could effectively allocate manpower to work taskings. In general, they readily supported the work pool concept and felt that it was an effective system that should be continued in the Army setting.

3.9 Discussion

The new scheduling approach established a work pool system from which personnel could be assigned to perform non-maintenance work details in a team fashion. Due to the dynamic characteristics of a work pool system, it can be demand-responsive to tasking requests and fulfill these requests as more efficiently than they are currently being met. Maintenance personnel performing their primary MOS job duties would not be interrupted as often as they were in the previous system. These previous methods of scheduling personnel to tasking requests, resulted in workers being disrupted while performing their primary job duties and created unnecessary start-up and shut-down procedures with increased overall task performance times. The new scheduling techniques utilized a small segment of the work force to fulfill tasking requests, thereby allowing the remaining workers to efficiently perform their maintenance duties.

Results of the evaluation indicated overall levels of success for using the work pool approach as a manpower scheduling device. The work pool

was able to fulfill the tasking requests from a number of sources, including First Sergeants, the Squadron CSM, troop supply sergeants, the Squadron Operator's Office and from the Brigade level. The versatility of the work pool is attested to by the wide variety of tasks which were performed. Some examples are painting details, installation support activities, guard duty, and distributing the military newspaper. In addition to the specific tasking requests, the work pool was able to provide a preventive tasking function by performing tasks that would eventually be tasked through channels but had not yet been formally requested.

The impact of the work pool system on the total military unit was especially significant. As anticipated, workers performing their primary MOS job activities experienced less job interruptions and were able to continuously perform their maintenance duties. A larger proportion of the work day was spent performing primary maintenance activities. By achieving this end, maintenance activities could be completed in a shorter span of time and workers did not have to resort to overtime measures in order to maintain the required operational readiness rates.

Perhaps the most valuable indicators of the success of the work pool system was provided by the participants themselves. Feedback from the troops overwhelmingly supported the work pool system. Being directly involved in the new scheduling approach, the troop personnel were highly satisfied with the scheduling technique, perceived reductions in job interruptions, and supported the continuation of the work pool concept in the military setting. First Sergeants and Platoon Sergeants also expressed the merits of the work pool system. They indicated that the new system enabled greater control over their workers, facilitated scheduling both maintenance and job training activities, and allowed

them to be aware of where personnel were at all times. They were especially pleased with the ease in which the work pool system was implemented, and somewhat startled at the simplicity but yet overall effectiveness of the scheduling technique. The pool approach enabled them to fulfill work details faster by requesting personnel directly from the Work Pool Supervisor, instead of going through the traditional chain-of-command procedures.

In summary, the work pool approach was able to achieve successful results in two major areas. First, the reduction in job interruptions provided the workers with an opportunity to focus their attention on the job "at hand." Workers no longer had to worry about setting up a work station, then being reassigned to perform another task. They could initiate and complete a whole and definable task. This job quality, commonly referred to as job closure, is an important ingredient in personal job satisfaction.

Secondly, the overall effectiveness of the organization was facilitated via the increased manpower control. Work supervisors were able to better schedule their available manpower because they knew that personnel would not be called away from a work station. This control better enabled them to meet the maintenance requirements.

Although further evaluations of the work pool approach are needed to cross validate the present findings, initial results are extremely encouraging. The simplicity of implementing this scheduling technique and its immediate effectiveness clearly indicates that the work pool system is a viable organizational incentive for increasing both overall system efficiency and worker satisfactions.

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APPENDIX A

DAILY ACTIVITY ANALYSIS -- DATA COLLECTION MATERIALS

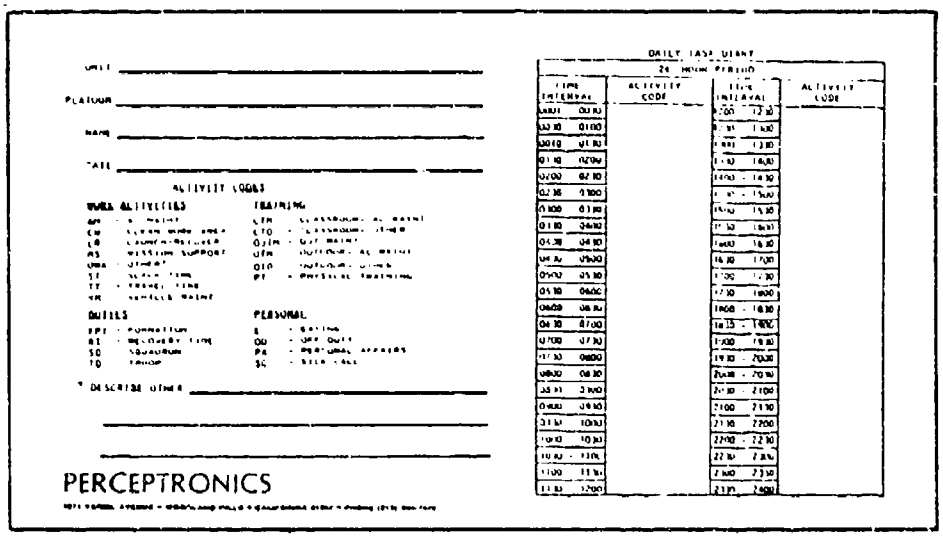
A1 - Daily Task Diary (Job Analysis)

A2 - Daily Activity Diary (Implementation Period)

A3 - Daily Activity Diary (Work Pool Personnel)

APPENDIX A-1. DAILY TASK DIARY (JOB ANALYSIS)

(FRONT VIEW)



UNIT _____

PLATOON _____

NAME _____

DATE _____

ACTIVITY CODES

WORK ACTIVITIES

AM	- A - MAINT
CW	- CLEAN WORK AREA
LR	- LAUNCH/RECOVER
MS	- MISSION SUPPORT
UWA	- OTHER*
TT	- TRAVEL TIME
VM	- VEHICLE MAINT

TRAINING

CTM	- CLASSROOM, AC MAINT
CTO	- CLASSROOM, OTHER
OJTM	- OJT MAINT
OTM	- OUTDOOR, AC MAINT
OTO	- OUTDOOR, OTHER
PT	- PHYSICAL TRAINING

BUTTLS

FPI	- FORMATION
RT	- RECOVERY TIME
SQ	- SQUADRON
TO	- TROOP

PERSONAL

E	- EATING
OD	- OFF DUTY
PA	- PERSONAL AFFAIRS
SC	- SICK CALL

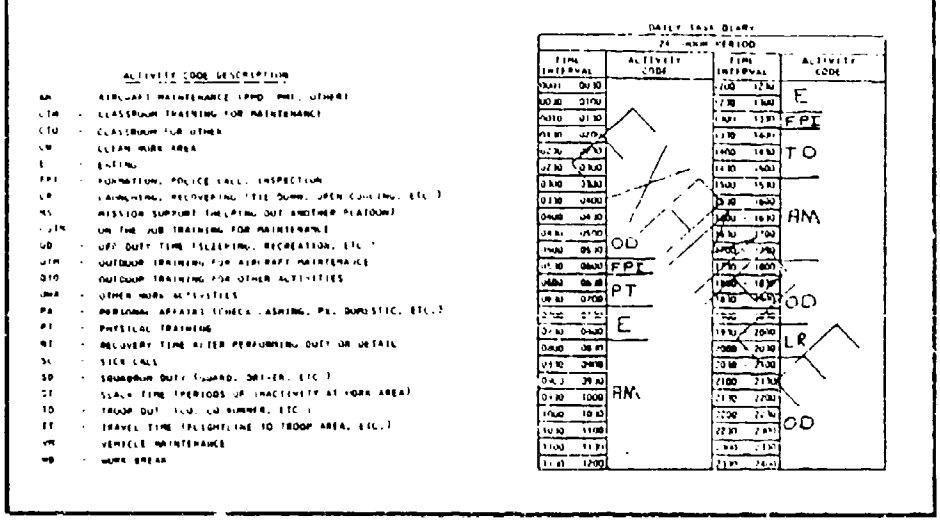
* DESCRIBE OTHER _____

PERCEPTRONICS

DAILY TASK DIARY
24 HOUR PERIOD

TIME INTERVAL	ACTIVITY CODE	TIME INTERVAL	ACTIVITY CODE
MIDNIGHT - 0030		1200 - 1230	
0030 - 0100		1230 - 1300	
0100 - 0130		1300 - 1330	
0130 - 0200		1330 - 1400	
0200 - 0230		1400 - 1430	
0230 - 0300		1430 - 1500	
0300 - 0330		1500 - 1530	
0330 - 0400		1530 - 1600	
0400 - 0430		1600 - 1630	
0430 - 0500		1630 - 1700	
0500 - 0530		1700 - 1730	
0530 - 0600		1730 - 1800	
0600 - 0630		1800 - 1830	
0630 - 0700		1830 - 1900	
0700 - 0730		1900 - 1930	
0730 - 0800		1930 - 2000	
0800 - 0830		2000 - 2030	
0830 - 0900		2030 - 2100	
0900 - 0930		2100 - 2130	
0930 - 1000		2130 - 2200	
1000 - 1030		2200 - 2230	
1030 - 1100		2230 - 2300	
1100 - 1130		2300 - 2330	
1130 - 1200		2330 - 2400	

(BACK VIEW)



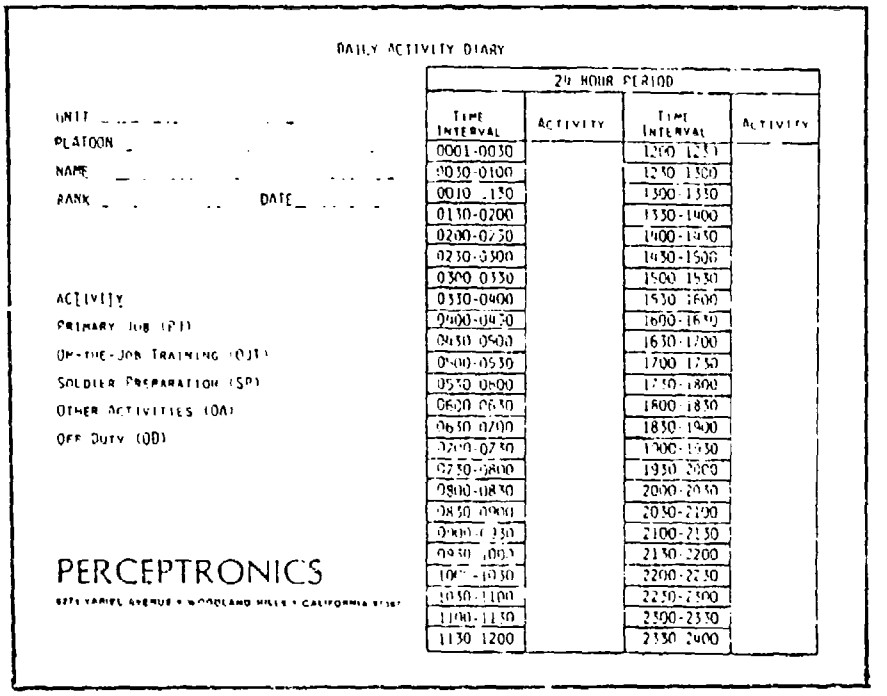
ACTIVITY CODE DESCRIPTION

AM	-	AIRCRAFT MAINTENANCE (PMD, PRE, OTHER)
CTM	-	CLASSROOM TRAINING FOR MAINTENANCE
CTO	-	CLASSROOM FOR OTHER
CW	-	CLEAN WORK AREA
E	-	EATING
FPI	-	FORMATION, POLICE CALL, INSPECTION
LR	-	LAUNCHING, RECOVERING (TIE DOWN, OPEN CANOPY, ETC.)
MS	-	MISSION SUPPORT (HELPING OUT ANOTHER PLATOON)
OJTM	-	ON THE JOB TRAINING FOR MAINTENANCE
OD	-	OFF DUTY TIME (SLEEPING, RECREATION, ETC.)
OTM	-	OUTDOOR TRAINING FOR AIRCRAFT MAINTENANCE
OTO	-	OUTDOOR TRAINING FOR OTHER ACTIVITIES
UWA	-	OTHER WORK ACTIVITIES
PA	-	PERSONAL AFFAIRS (CHECK CASHING, PX, DOMESTIC, ETC.)
PT	-	PHYSICAL TRAINING
RT	-	RECOVERY TIME AFTER PERFORMING DUTY OR DETAIL
SC	-	SICK CALL
SQ	-	SQUADRON DUTY (GUARD, DRIVER, ETC.)
ST	-	STAND TIME (PERIODS OF INACTIVITY AT WORK AREA)
TO	-	TROOP DUT (C.Q. CA DUMMER, ETC.)
TT	-	TRAVEL TIME (FLIGHTLINE TO TROOP AREA, ETC.)
VM	-	VEHICLE MAINTENANCE
WB	-	WORK BREAK

DAILY TASK DIARY
24 HOUR PERIOD

TIME INTERVAL	ACTIVITY CODE	TIME INTERVAL	ACTIVITY CODE
MIDNIGHT - 0030		1200 - 1230	E
0030 - 0100		1230 - 1300	FPI
0100 - 0130		1300 - 1330	
0130 - 0200		1330 - 1400	TO
0200 - 0230		1400 - 1430	
0230 - 0300		1430 - 1500	
0300 - 0330		1500 - 1530	
0330 - 0400		1530 - 1600	
0400 - 0430		1600 - 1630	AM
0430 - 0500	OD	1630 - 1700	
0500 - 0530		1700 - 1730	
0530 - 0600	FPI	1730 - 1800	
0600 - 0630	PT	1800 - 1830	
0630 - 0700		1830 - 1900	OD
0700 - 0730	E	1900 - 1930	
0730 - 0800		1930 - 2000	
0800 - 0830		2000 - 2030	LR
0830 - 0900		2030 - 2100	
0900 - 0930		2100 - 2130	
0930 - 1000	AM	2130 - 2200	
1000 - 1030		2200 - 2230	
1030 - 1100		2230 - 2300	OD
1100 - 1130		2300 - 2330	
1130 - 1200		2330 - 2400	

APPENDIX A-2. DAILY ACTIVITY DIARY (IMPLEMENTATION PERIOD)



DAILY ACTIVITY DIARY

UNIT _____

PLATOON _____

NAME _____

RANK _____ DATE _____

ACTIVITY

PRIMARY JOB (PJ)

ON-THE-JOB TRAINING (OJT)

SOLDIER PREPARATION (SP)

OTHER ACTIVITIES (OA)

OFF DUTY (OD)

PERCEPTRONICS

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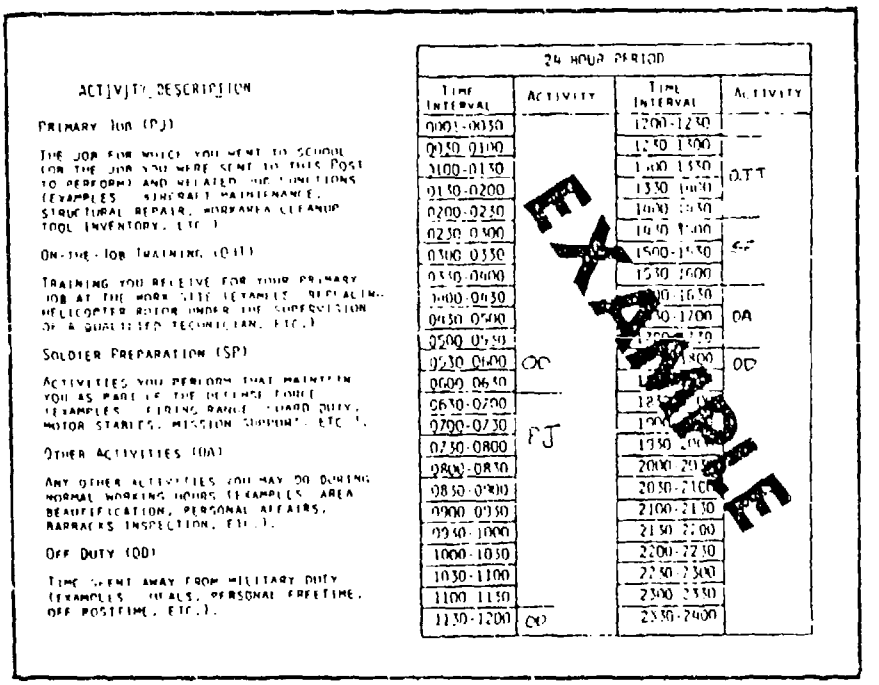
24 HOUR PERIOD			
TIME INTERVAL	ACTIVITY	TIME INTERVAL	ACTIVITY
0001-0030		1200-1230	
0030-0100		1230-1300	
0100-0130		1300-1330	
0130-0200		1330-1400	
0200-0230		1400-1430	
0230-0300		1430-1500	
0300-0330		1500-1530	
0330-0400		1530-1600	
0400-0430		1600-1630	
0430-0500		1630-1700	
0500-0530		1700-1730	
0530-0600		1730-1800	
0600-0630		1800-1830	
0630-0700		1830-1900	
0700-0730		1900-1930	
0730-0800		1930-2000	
0800-0830		2000-2030	
0830-0900		2030-2100	
0900-0930		2100-2130	
0930-1000		2130-2200	
1000-1030		2200-2230	
1030-1100		2230-2300	
1100-1130		2300-2330	
1130-1200		2330-2400	



ACTIVITY DESCRIPTION

PRIMARY JOB (PJ)

THE JOB FOR WHICH YOU WENT TO SCHOOL FOR THE JOB YOU WERE SENT TO THIS POST TO PERFORM AND RELATED JOB FUNCTIONS (EXAMPLES: AIRCRAFT MAINTENANCE, STRUCTURAL REPAIR, HARDWARE CLEANUP, TOOL INVENTORY, ETC.)

ON-THE-JOB TRAINING (OJT)

TRAINING YOU RECEIVE FOR YOUR PRIMARY JOB AT THE WORK SITE (EXAMPLES: REPLACING HELICOPTER ROTOR UNDER THE SUPERVISION OF A QUALIFIED TECHNICIAN, ETC.)

SOLDIER PREPARATION (SP)

ACTIVITIES YOU PERFORM THAT MAINTAIN YOU AS PART OF THE DEFENSE FORCE (EXAMPLES: FIRING RANGE, GUARD DUTY, MOTOR STABLES, MISSION SUPPORT, ETC.).

OTHER ACTIVITIES (OA)

ANY OTHER ACTIVITIES YOU MAY DO DURING NORMAL WORKING HOURS (EXAMPLES: AREA BEAUTIFICATION, PERSONAL AFFAIRS, BARRACKS INSPECTION, ETC.).

OFF DUTY (OD)

TIME SPENT AWAY FROM MILITARY DUTY (EXAMPLES: MEALS, PERSONAL FREETIME, OFF POST TIME, ETC.).

EXAMPLE

24 HOUR PERIOD			
TIME INTERVAL	ACTIVITY	TIME INTERVAL	ACTIVITY
0001-0030		1200-1230	
0030-0100		1230-1300	
0100-0130		1300-1330	OJT
0130-0200		1330-1400	
0200-0230		1400-1430	
0230-0300		1430-1500	
0300-0330		1500-1530	SP
0330-0400		1530-1600	
0400-0430		1600-1630	
0430-0500		1630-1700	OA
0500-0530		1700-1730	
0530-0600		1730-1800	OD
0600-0630	OD	1800-1830	
0630-0700		1830-1900	
0700-0730	PJ	1900-1930	
0730-0800		1930-2000	
0800-0830		2000-2030	
0830-0900		2030-2100	
0900-0930		2100-2130	
0930-1000		2130-2200	
1000-1030		2200-2230	
1030-1100		2230-2300	
1100-1130		2300-2330	
1130-1200	OD	2330-2400	

APPENDIX A-3. DAILY ACTIVITY DIARY (WORK POOL PERSONNEL)

DAILY ACTIVITY DIARY (Pool Personnel)

UNIT _____

PLATOON _____

NAME _____

RANK _____ DATE _____

ACTIVITY

PERFORMING ASSIGNED TASK (PAT)

AWAITING ASSIGNMENT (AA)

EATING (E)

PERSONAL AFFAIRS (PA)

OFF DUTY (OD)

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24 HOUR PERIOD

Time Interval	Activity	Time Interval	Activity
0001-0030		1200-1230	
0030-0100		1230-1300	
0100-0130		1300-1330	
0130-0200		1330-1400	
0200-0230		1400-1430	
0230-0300		1430-1500	
0300-0330		1500-1530	
0330-0400		1530-1600	
0400-0430		1600-1630	
0430-0500		1630-1700	
0500-0530		1700-1730	
0530-0600		1730-1800	
0600-0630		1800-1830	
0630-0700		1830-1900	
0700-0730		1900-1930	
0730-0800		1930-2000	
0800-0830		2000-2030	
0830-0900		2030-2100	
0900-0930		2100-2130	
0930-1000		2130-2200	
1000-1030		2200-2230	
1030-1100		2230-2300	
1100-1130		2300-2330	
1130-1200		2330-2400	

ACTIVITY DESCRIPTION

PERFORMING ASSIGNED TASK (PAT)

- Performing assigned work.

AWAITING ASSIGNMENT (AA)

- Waiting for work assignment at pooled center.

EATING (E)

- Time spent during meals.

PERSONAL AFFAIRS (PA)

- Personal activities during the course of the work day.

OFF DUTY (OD)

- Time spent away from military duty.

24 HOUR PERIOD

Time Interval	Activity	Time Interval	Activity
0001-0030		1200-1230	E
0030-0100		1230-1300	
0100-0130		1300-1330	PAT
0130-0200		1330-1400	
0200-0230		1400-1430	
0230-0300		1430-1500	
0300-0330		1500-1530	
0330-0400		1530-1600	
0400-0430	OD	1600-1630	PA
0430-0500		1630-1700	
0500-0530		1700-1730	
0530-0600		1730-1800	OD
0600-0630		1800-1830	
0630-0700		1830-1900	
0700-0730	AA	1900-1930	
0730-0800		1930-2000	
0800-0830		2000-2030	
0830-0900		2030-2100	
0900-0930		2100-2130	
0930-1000		2130-2200	
1000-1030	PAT	2200-2230	
1030-1100		2230-2300	
1100-1130		2300-2330	
1130-1200		2330-2400	

EXAMPLE

APPENDIX B

TASKING ANALYSIS - DATA COLLECTION MATERIALS

B1 - Task Demands Form (Job Analysis)

B2 - Tasking Request Form (Implementation Period)

APPENDIX B-1. TASK DEMANDS FORM (JOB ANALYSIS)

TASK DEMANDS FORM
(FOR TASKING SGT'S ONLY)

NOTES:
1. REPORT ALL TASKINGS EACH DAY ON THIS CARD
2. INCLUDE LONG LEADTIME TASKING (TRNG, ETC)
3. IF NO TASKING OCCURS DURING THE DAY, PUT "NONE" ON THIS CARD AND TURN IT IN
4. IF MORE THAN FOUR TASKINGS OCCUR IN ONE DAY, USE ADDITIONAL CARD(S)

UNIT _____

PLATOON _____

NAME _____

DATE _____

	TASKING 1	TASKING 2	TASKING 3	TASKING 4
DEMANDING AGENCY OR PERSON				
LEADTIME				
REASON FOR REQUEST				
NUMBER OF PEOPLE SENT (NAMES)				
TOTAL TIME REQUESTED TO PERFORM TASK				
AGENCY OR PERSON TO WHOM THIS REQUEST IS PASSED (IF ANY)				

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APPENDIX B-2. TASK REQUEST FORM (IMPLEMENTATION PERIOD)

TASKING REQUEST FORM

UNIT_____ NAME_____

NUMBER OF PERSONS AVAILABLE ON THIS DATE_____ DATE_____

TASKING INFORMATION	TASKING #1	TASKING #2	TASKING #3	TASKING #4
SOURCE: WHERE OR WHO DID THE TASKING COME FROM.				
NATURE: FOR WHAT ACTIVITY WERE PERSONNEL REQUESTED.				
PERSONNEL REQUIRED: HOW MANY PERSONS WERE REQUESTED FOR THIS TASKING?				
DISPOSITION:				
TASKING SENT TO PLATOON (IDENTIFY)	--------	--------	--------	--------
TASKING SENT TO POOL (CIRCLE ONE)	YES NO	YES NO	YES NO	YES NO
WAS TASKING ACCEPTED BY POOL? (CIRCLE ONE)	YES NO	YES NO	YES NO	YES NO
SENT BACK TO PLATOON (IDENTIFY)	--------	--------	--------	--------

APPENDIX C

PERSONNEL ATTITUDES - DATA COLLECTION MATERIALS

C1 - Perceptronics Job Survey

C2 - Work Pool Evaluation Form (Troop)

C3 - Work Pool Evaluation Interview (First Sergeants)

C4 - Work Pool Evaluation Interview (Platoon Sergeants)

UNIT_____

PLATOON_____

NAME_____

PERCEPTRONICS JOB SURVEY

PERCEPTRONICS

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PERCEPTRONICS JOB SURVEY

THIS QUESTIONNAIRE WAS DEVELOPED AS PART OF A PERCEPTRONICS STUDY TO INVESTIGATE THE INFLUENCES OF ORGANIZATIONAL FACTORS ON PERSONNEL PRODUCTIVITY AND JOB SATISFACTION.

ON THE FOLLOWING PAGES YOU WILL FIND SEVERAL DIFFERENT KINDS OF QUESTIONS ABOUT YOUR JOB. SPECIFIC INSTRUCTIONS ARE GIVEN AT THE START OF EACH SECTION. PLEASE READ THEM CAREFULLY.

THE QUESTIONS ARE DESIGNED TO OBTAIN <u>YOUR</u> PERCEPTIONS OF YOUR JOB AND <u>YOUR</u> REACTIONS TO IT.

THERE ARE NO "TRICK" QUESTIONS. YOUR INDIVIDUAL ANSWERS WILL BE KEPT COMPLETELY CONFIDENTIAL. PLEASE ANSWER EACH ITEM AS HONESTLY AND FRANKLY AS POSSIBLE.

THANK YOU FOR YOUR COOPERATION

SECTION 1

1. AGE AT LAST BIRTHDAY? _____

2. SEX MALE _____ FEMALE _____

3. MARRIED? YES _____ NO _____

4. WHAT IS YOUR HIGHEST LEVEL OF EDUCATION? CHECK ONE

   DID NOT FINISH HIGH SCHOOL _____ 3-4 YEARS COLLEGE _____
   HIGH SCHOOL GRADUATE _____ MORE THAN 4 YEARS COLLEGE _____
   1-2 YEARS COLLEGE _____

5. WHAT IS YOUR RANK? CHECK ONE

   PRIVATE _____ SPEC 4 _____ SPEC 5 _____ SPEC 6 _____ SPEC 7 _____
   PRIVATE 1ST CLASS _____ CORPORAL _____ SGT _____ S SGT _____ SGT 1ST CLASS _____

6. TIME IN GRADE? YEARS _____ MONTHS _____

7. HOW MANY YEARS IN THE MILITARY? YEARS _____

8. HOW LONG HAVE YOU BEEN IN THIS UNIT? YEARS _____ MONTHS _____

9. WHAT IS YOUR MOS? (NUMBER AND DESCRIPTION, E.G., 67V CH-46 HELICOPTER MECHANIC)

   PRIMARY _____

   SECONDARY _____

10. HOW LONG AFTER TECHNICAL TRAINING DID IT TAKE BEFORE YOU WERE PROFICIENT AT YOUR JOB? CHECK ONE

    IMMEDIATELY _____ 4- 6 MONTHS _____ MORE THAN 12 MONTHS _____
    1-3 MONTHS _____ 7-12 MONTHS _____ STILL DO NOT FEEL PROFICIENT _____

11. DO YOU PLAN TO MAKE THE MILITARY A CAREER? YES _____ NO _____

    IF SO, WHY SO? IF NOT, WHY NOT? _____

12. DO YOU PLAN TO REENLIST WHEN YOUR ENLISTMENT IS UP? YES _____ NO _____

SECTION 2

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.

YOU ARE TO CIRCLE THE NUMBER WHICH IS THE MOST ACCURATE DESCRIPTION OF YOUR JOB.

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 CIRCLE THE NUMBER SIX, AS WAS DONE IN THE EXAMPLE ABOVE.

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 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 <u>variety</u> is there is 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 tools, using a number of different skills and talents.

4. In general, how <u>significant or important</u> is your job? This 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 <u>managers or co-workers</u> let you know how well you are doing on your job?

1——————2——————3——————4——————5——————6——————7

Very little; managers or co-worker almost never let me know how well I am doing.	Moderately; sometimes managers or co-workers may give me "feedback"; other times they may not.	Very much; managers or co-workers provide me with almost constant "feedback" about how well I am doing.

6. To what extent does <u>doing the job itself</u> provide you with information about your work performance? That is, does the actual <u>work itself</u> 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" about how well I am doing.

SECTION 3

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.

WRITE A NUMBER IN THE BLANK BESIDE EACH STATEMENT, BASED ON THE FOLLOWING SCALE:

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

1. THE JOB REQUIRES ME TO USE A NUMBER OF COMPLEX OR HIGH-LEVEL SKILLS ....._____
2. THE JOB IS ARRANGED SO THAT I DO NOT HAVE A CHANCE TO DO AN ENTIRE PIECE OF WORK FROM BEGINNING TO END ....._____
3. JUST DOING THE WORK REQUIRED BY THE JOB PROVIDES MANY CHANCES FOR ME TO FIGURE OUT HOW WELL I AM DOING ....._____
4. THE JOB IS QUITE SIMPLE AND REPETITIVE ....._____
5. THE SUPERVISORS AND CO-WORKERS ON THIS JOB ALMOST NEVER GIVE ME ANY "FEEDBACK" ABOUT HOW WELL I AM DOING IN MY WORK ....._____
6. THIS JOB IS ONE WHERE A LOT OF OTHER PEOPLE CAN BE AFFECTED BY HOW WELL THE WORK GETS DONE.____
7. THE JOB DENIES ME ANY CHANCE TO USE MY PERSONAL INITIATIVE OR JUDGEMENT IN CARRYING OUT THE WORK ....._____
8. SUPERVISORS OFTEN LET ME KNOW HOW WELL THEY THINK I AM PERFORMING THE JOB ....._____
9. THE JOB PROVIDES ME THE CHANCE TO COMPLETELY FINISH THE TASKS I BEGIN ....._____
10. THE JOB ITSELF PROVIDES VERY FEW CLUES ABOUT WHETHER OR NOT I AM PERFORMING WELL ....._____
11. THE JOB GIVES ME CONSIDERABLE OPPORTUNITY FOR INDEPENDENCE AND FREEDOM IN HOW I DO MY WORK ....._____
12. THE JOB ITSELF IS NOT VERY SIGNIFICANT OR IMPORTANT IN THE BROADER SCHEME OF THINGS ...._____

SECTION 4

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.

WRITE A NUMBER IN THE BLANK FOR EACH STATEMENT, BASED ON THIS SCALE:

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

1. MY OPINION OF MYSELF GOES UP WHEN I DO THIS JOB WELL..... _____

2. GENERALLY SPEAKING, I AM VERY SATISFIED WITH THIS JOB ..... _____

3. I FEEL A GREAT SENSE OF PERSONAL SATISFACTION WHEN I DO THIS JOB WELL ..... _____

4. I FREQUENTLY THINK OF QUITTING THIS JOB ..... _____

5. I FEEL BAD AND UNHAPPY WHEN I DISCOVER THAT I HAVE PERFORMED POORLY ON THIS JOB ..... _____

6. I AM GENERALLY SATISFIED WITH THE KIND OF WORK I DO IN THIS JOB ..... _____

7. MY OWN FEELINGS GENERALLY ARE NOT AFFECTED MUCH ONE WAY OR THE OTHER BY HOW WELL I DO ON THIS JOB..... _____

SECTION 5

NOW PLEASE INDICATE HOW SATISFIED YOU ARE WITH EACH ASPECT OF YOUR JOB LISTED BELOW. ONCE AGAIN, WRITE THE APPROPRIATE NUMBER IN THE BLANK BESIDE EACH STATEMENT.

HOW SATISFIED ARE YOU WITH THIS ASPECT OF YOUR JOB?

1	2	3	4	5	6	7
EXTREMELY DISSATISFIED	DISSATISFIED	SLIGHTLY DISSATISFIED	NEUTRAL	SLIGHTLY SATISFIED	SATISFIED	EXTREMELY SATISFIED

1. THE AMOUNT OF PERSONAL GROWTH AND DEVELOPMENT I GET IN DOING MY JOB ....._____
2. THE DEGREE OF RESPECT AND FAIR TREATMENT I RECEIVE FROM MY SUPERVISOR....._____
3. THE FEELING OF WORTHWHILE ACCOMPLISHMENT I GET FROM DOING MY JOB....._____
4. THE AMOUNT OF SUPPORT AND GUIDANCE I RECEIVE FROM MY SUPERVISOR ....._____
5. THE AMOUNT OF INDEPENDENT THOUGHT AND ACTION I CAN EXERCISE IN MY JOB ....._____
6. THE AMOUNT OF CHALLENGE IN MY JOB ....._____
7. THE OVERALL QUALITY OF THE SUPERVISION I RECEIVE IN MY WORK ....._____

SECTION 6

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 in this scale are different from those used in previous scales.

4———5———6———7———8———9———10

WOULD LIKE HAVING THIS ONLY A MODERATE AMOUNT (OR LESS)	WOULD LIKE HAVING THIS VERY MUCH	WOULD LIKE HAVING THIS EXTREMELY MUCH

1. HIGH RESPECT AND FAIR TREATMENT FROM MY SUPERVISOR.....____
2. STIMULATING AND CHALLENGING WORK.....____
3. CHANCES TO EXERCISE INDEPENDENT THOUGHT AND ACTION IN MY JOB .....____
4. GREAT JOB SECURITY .....____
5. VERY FRIENDLY CO-WORKERS .....____
6. OPPORTUNITIES TO LEARN NEW THINGS FROM MY WORK.....____
7. HIGH SALARY AND GOOD FRINGE BENEFITS .....____
8. OPPORTUNITIES TO BE CREATIVE AND IMAGINATIVE IN MY WORK .....____
9. QUICK PROMOTIONS .....____
10. OPPORTUNITIES FOR PERSONAL GROWTH AND DEVELOPMENT IN MY JOB .....____
11. A SENSE OF WORTHWHILE ACCOMPLISHMENT IN MY WORK .....____

SECTION 7

THIS SECTION INVOLVES VARIOUS ASPECTS OF YOUR JOB. YOU ARE TO RATE TO WHAT EXTENT YOU BELIEVE THE FOLLOWING ITEMS ARE TRUE BY PUTTING THE APPROPRIATE NUMBER ON THE RATING SCALE IN THE SPACE PROVIDED.

1——————2——————3——————4——————5

VERY LITTLE EXTENT	LITTLE EXTENT	SOME EXTENT	GREAT EXTENT	VERY GREAT EXTENT

1. TO WHAT EXTENT DO SUPERVISORS GIVE ASSIGNMENTS OR DIRECTIONS THAT CONFLICT WITH DIRECTIVES GIVEN BY OTHER SUPERVISORS? ....._____
2. TO WHAT EXTENT DO YOU RECEIVE CLEAR JOB INSTRUCTIONS FROM YOUR SUPERVISORS?....._____
3. TO WHAT EXTENT DOES YOUR SUPERVISOR ASK YOUR OPINION WHEN A PROBLEM RELATED TO YOUR WORK ARISES? ....._____
4. TO WHAT EXTENT DOES YOUR SUPERVISOR SET A GOOD EXAMPLE FOR HIGH PERFORMANCE?....._____
5. TO WHAT EXTENT IS IT DIFFICULT TO GET PROBLEMS RESOLVED BECAUSE THOSE IN AUTHORITY DO NOT RESPOND TO OR MAKE PROMPT DECISIONS OR RECOMMENDATIONS?....._____
6. TO WHAT EXTENT DOES YOUR SUPERVISOR PROPERLY MONITOR YOUR WORK PERFORMANCE?....._____
7. TO WHAT EXTENT IS WORK TIME LOST THROUGH POOR SCHEDULING AND PLANNING?....._____
8. TO WHAT EXTENT DOES YOUR SUPERVISOR CORRECT YOUR BEHAVIOR IF YOU PERFORM POORLY IN YOUR JOB?....._____
9. TO WHAT EXTENT IS INFORMATION CONCERNING REASONS WHY THINGS ARE DONE THE WAY THEY ARE COMMUNICATED TO WORKING PERSONNEL?....._____
10. TO WHAT EXTENT IS YOUR SUPERVISOR ABLE TO PLAN AND COORDINATE YOUR WORK GROUP'S ACTIVITIES SO THAT MAXIMUM PERFORMANCE IS POSSIBLE? ....._____
11. TO WHAT EXTENT DO INTERRUPTIONS OCCUR IN YOUR DAILY ROUTINE THAT TAKE YOU AWAY FROM YOUR PRIMARY JOB?....._____
12. TO WHAT EXTENT IS YOUR SUPERVISOR RESPONSIBLE TO THE NEEDS OF HIS SUBORDINATES?...._____
13. TO WHAT EXTENT DO YOU ENJOY PERFORMING YOUR PRIMARY JOB?....._____
14. TO WHAT EXTENT DOES YOUR GROUP WORK WELL TOGETHER AS A TEAM?....._____
15. TO WHAT EXTENT ARE WORKERS HERE UNDER A LOT OF PRESSURE TO GET JOBS FINISHED?....._____
16. TO WHAT EXTENT WOULD YOU LIKE TO SPEND MORE TIME PERFORMING YOUR PRIMARY JOB?....._____

1————2————3————4————5

VERY LITTLE EXTENT	LITTLE EXTENT	SOME EXTENT	GREAT EXTENT	VERY GREAT EXTENT

17. TO WHAT EXTENT DOES THE PERFORMANCE OF YOUR JOB CONTRIBUTE TO THE EFFECTIVENESS OF YOUR PRIMARY JOB?.....____

18. TO WHAT EXTENT DOES YOUR SUPERVISOR EMPHASIZE HIGH STANDARDS OF PERFORMANCE?.....____

19. TO WHAT EXTENT DOES YOUR SUPERVISOR MAKE CLEAR TO YOU WHAT ASPECTS OF YOUR PERFORMANCE HE CONSIDERS TO BE MOST IMPORTANT?.....____

20. TO WHAT EXTENT DOES YOUR SUPERVISOR ENCOURAGE YOU TO HELP IN DEVELOPING WORK METHODS AND JOB PROCEDURES?.....____

21. TO WHAT EXTENT DO YOU SPEND YOUR TIME PERFORMING YOUR PRIMARY JOB?.....____

22. TO WHAT EXTENT DOES YOUR SUPERVISOR LET YOU DO YOUR WORK IN THE WAY YOU THINK IS BEST?____

23. TO WHAT EXTENT CAN A WORKER BE PROUD TO SAY HE WORKS HERE? .....____

24. TO WHAT EXTENT DO DISCUSSIONS WITH OTHER MEMBERS OF YOUR WORK GROUP ASSIST YOU IN PERFORMING YOUR JOB? .....____

25. TO WHAT EXTENT DO WORKERS IN YOUR WORK GROUP TRUST AND HAVE CONFIDENCE IN YOUR SUPERVISOR? .....____

26. TO WHAT EXTENT ARE YOUR JOB DUTIES CLEARLY DEFINED BY YOUR SUPERVISOR?.....____

27. TO WHAT EXTENT IS YOUR JOB AS IMPORTANT AS YOU WERE LED TO BELIEVE IN YOUR INITIAL TRAINING?.....____

28. TO WHAT EXTENT IS INFORMATION COMMUNICATED QUICKLY TO YOU CONCERNING CHANGES IN PROCEDURES, POLICIES, ETC?.....____

29. TO WHAT EXTENT IS YOUR SUPERVISOR CONCERNED WITH THE QUALITY OF WORK YOU TURN OUT IN YOUR PRESENT JOB? .....____

30. TO WHAT EXTENT WILL YOUR SUPERVISOR GO OUT OF HIS WAY TO HELP YOU DO AN OUTSTANDING JOB? .....____

31. TO WHAT EXTENT IS YOUR SUPERVISOR MORE CONCERNED ABOUT MEETING SCHEDULES THAN HE IS ABOUT THE WELFARE OF HIS WORKERS? .....____

32. TO WHAT EXTENT IS YOUR SUPERVISOR SUCCESSFUL IN HIS INTERACTIONS WITH HIGHER LEVELS OF COMMAND?.....____

1——————2——————3——————4——————5

VERY LITTLE EXTENT	LITTLE EXTENT	SOME EXTENT	GREAT EXTENT	VERY GREAT EXTENT

33. TO WHAT EXTENT DOES IT BOTHER YOU TO HEAR (OR READ ABOUT) SOMEONE CRITICIZING THIS UNIT OR COMPARING THIS UNIT UNFAVORABLY TO OTHER UNITS? .....

34. TO WHAT EXTENT DOES YOUR SUPERVISOR PROPERLY MONITOR YOUR PERFORMANCE? .....

35. TO WHAT EXTENT ARE WORKERS HERE UNDER A LOT OF PRESSURE TO GET JOBS FINISHED?.....

36. TO WHAT EXTENT ARE YOU CALLED AWAY FROM YOUR PRIMARY JOB TO PERFORM OTHER DUTIES OR DETAILS?.....

37. TO WHAT EXTENT DO YOU RECEIVE FORMAL, ON THE JOB TRAINING?.....

38. TO WHAT EXTENT DO YOU RECEIVE INFORMAL, ON THE JOB TRAINING?.....

39. TO WHAT EXTENT IS THE ON THE JOB TRAINING YOU RECEIVE HELPFUL?.....

40. TO WHAT EXTENT HAVE YOU MISSED ON THE JOB TRAINING BECAUSE YOU WERE CALLED AWAY FOR OTHER DUTIES OR DETAILS?.....

41. TO WHAT EXTENT DO I HAVE ENOUGH TIME TO TAKE CARE OF MY PERSONAL AND FAMILY NEEDS?.....

42. TO WHAT EXTENT ARE WORKLOAD AND TIME FACTORS TAKEN INTO CONSIDERATION IN PLANNING YOUR WORK GROUP ASSIGNMENTS?.....

43. TO WHAT EXTENT ARE WORK ASSIGNMENTS MADE ON A FAIR BASIS? .....

44. TO WHAT EXTENT ARE YOU GIVEN THE CHANCE TO COMPLETELY FINISH THE TASKS YOU BEGIN?.....

APPENDIX C-2. WORK POOL EVALUATION FORM (TROOP)

Were you ever assigned to the work pool? Yes_____ No_____

Use this scale to answer the following questions:

1	2	3	4	5
Very Little Extent	Little Extent	Some Extent	Great Extent	Very Great Extent

(1) To what extent has the amount of primary job interruptions decreased since the work pool system began? . . _____

(2) To what extent did the work pool system directly affect you? . . . . . _____

(3) To what extent did you like the work pool system for scheduling manpower to work details? . . . . . _____

(4) To what extent do you feel the work pool system is an effective method of assigning individuals to work tasks even though you may not personnaly like it? . . _____

(5) To what extent do you feel the idea of a work pool system should be continued? . . . . . _____

APPENDIX C-3. WORK POOL EVALUATION INTERVIEW (FIRST SERGEANTS)

1. Were you able to reduct the amount of task requests to the platoon sergeants, due to the presence of the work pool?

2. How effective do you perceive the work pool system to be?

3. Was the work pool system easy/difficult to organize and implement?

4. Did you ever find that the work pool could not accommodate a task request due to unavailability of manpower?

   If so, how frequently?

5. Did you find that you had to check-back with the pool supervisor to ensure the task was done?

6. What do you think are the attitudes of the platoon sergeants toward the work pool system?

7. Do you feel the work pool system can be effectively incorporated into the military setting? Why or why not? Modifications?

APPENDIX C-4. WORK POOL EVALUATION INTERVIEW (PLATOON SERGEANTS)

1. Do you feel the work pool system has helped you to maintain a more stable work force? Greater amount of manpower?

2. Do you feel the troops liked the work pool approach? Why or why not? (Reward/Punishment)

3. What was the impact of having men taken from your unit to participate in the work pool on: Administering OJT: Scheduling of work? Predictability of manpower?

4. In your opinion, is the work pool system better, the same, or worse than the previous system?

5. Do you feel the work pool system can be effectively incorporated into the military setting?

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