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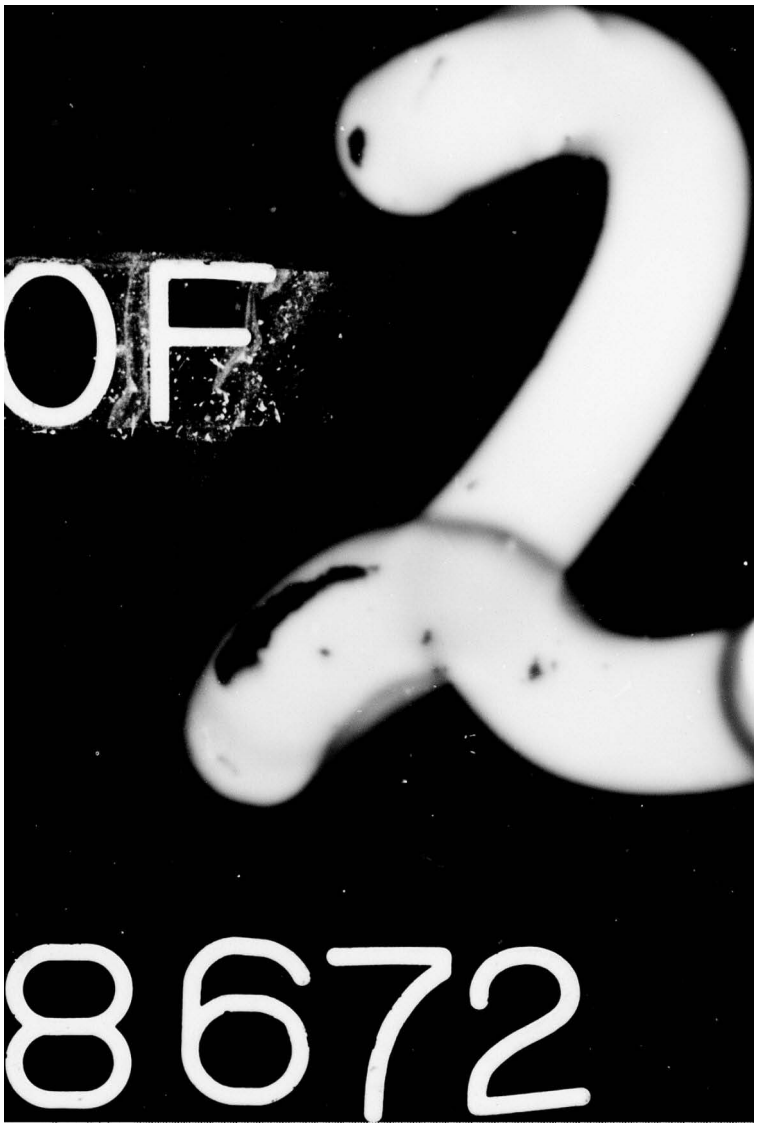
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THESIS

ANALYSIS OF ORGANIZATIONAL AVIATION MAINTENANCE TRAINING WITHIN THE UNITED STATES MARINE CORPS

by

Coleman Daniel Kuhn Jr.
Major, United States Marine Corps

December 1977

Thesis Advisor: J.K. Arima

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ANALYSIS OF ORGANIZATIONAL AVIATION MAINTENANCE TRAINING WITHIN THE UNITED STATES MARINE CORPS

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Submitted in partial fulfillment of the
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ABSTRACT

A systems analysis of the Marine Corps' organizational aviation maintenance training program was conducted. A survey, using a research interview and questionnaire, covered a total of ten Marine squadrons in two of the three active Marine Aircraft Wings to identify the existing state of individual aviation maintenance training that is currently performed at the squadron level. Responses were analyzed with appropriate nonparametric tests, aggregated, and compared to common elements of the individual training programs from the other services. Conclusions identified the existing state of aviation maintenance training relative to an emphasis on unit training. It was recommended that a serious review of individual training be conducted and, that modifications to positive programs of the other services be considered as possible improvements to the current Marine Corps individual training program.

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ABBREVIATIONS

1. AMO.....Aircraft Maintenance Officer
2. AFM.....Air Force Manual
3. AFS.....Air Force Specialty
4. Aver.....Average
5. CDC.....Career Development Course
6. CDI.....Collateral Duty Inspector
7. Cpl.....Rank of Corporal
8. Crs.....Course
9. CFD.....Cumulative Frequency Distribution
10. Enl.....Enlistedman, Pfc to Sgt
11. EPMS.....Enlisted Personnel Management System
12. Form Sch..Formal School
13. Indiv.....Individual
14. IMA.....Intermediate Maintenance Activity
15. L/Cpl.....Rank of Lance Corporal
16. MAW.....Marine Aircraft Wing
17. MCCRES....Marine Corps Combat Evaluation System
18. MOS.....Military Occupational Specialty
19. NAESU.....Naval Engineering Support Unit
20. NAMTRADET.Naval Aviation Maintenance Training Detach.
21. NATOPS....Naval Aviation Training and Operational Standards
22. OJT.....On-the-Job Training
23. PAR.....Personnel Advancement Requirement
24. PQS.....Personnel Qualification Standards
25. Pfc.....Rank of Private First Class
26. Sgt.....Rank of Sergeant
27. SKT.....Skill Knowledge Test
28. SQT.....Skill Qualification Test
29. STS.....Specialty Training Standards

30. Sqn Trng..Squadron Training
31. Std Dev...Standard Deviation
32. Supr.....Supervisor
33. TEC.....Technical Extension Course
34. TAD.....Temporary Additional Duty
35. TME.....Trainee Management Unit
36. TMU.....Trainee Management Unit
37. TOT.....Total
38. W/C.....Work Center

I. INTRODUCTION

> "Few organizations would admit that they can survive without it [training] - yet some act as though they could,"
>
> [DePhillips, p.5]

reflects a personal perception of the Marine Corps' attitude towards aviation maintenance training that is conducted within organizational units. This analysis will attempt to identify the scope of this perception, test its validity, and provide suitable solution alternatives to the problems substantiated by the analysis.

Training has been defined as " the process by which an organization seeks, in a planned, coordinated, and continuous manner, to develop in all employees those skills, understandings, and attitudes that will maximize individual present and future efficiency, and the effectiveness of the overall company operation." [DePhillips, p.24] It is an intentional act that provides a means for learning to take place. Tickner feels that without an organized training program, the process of learning is based on trial and error, bringing success only to the most persistent. This process is certain to be prolific in the formulation of bad habits, and the breeding of discouragement and frustration. Later he writes that "success in an unorganized system of training comes not to the aptest pupil, but to the one psychologically best adjusted to meet the discouragement of indifference." [Tickner, p.11] Industrial training tries to redirect these random learning experiences into positive channels that evenly affect all members of an organization.

Having briefly identified the concept of training, a look at the history of industrial training will provide a valuable reference frame for developing current training programs and understanding some of their problems.

During the early twentieth century, one of the dominant characteristics of the period was the prevalence of the owner-manager. His thoughts were focused on his machines, the processing of his product, and the resultant profit. The people needed to run the machines were necessary but incidential, since skilled labor was abundant and cheap. Due to the emphasis on production, man was viewed solely as an extension of the machine that he manipulated. Artisians and craftsmen were absorbed by industry to provide a mass produced product of consistent quality. This period saw rapid industrial growth, that was fostered by an abundance of raw materials, power, and skilled labor. Since the owner-manager was mostly self-taught and self-motivated, he saw no reason for others not to follow his example. When the refinement of production reached the point where it became necessary to hire unskilled workers in large numbers, the owner-manager applied similar standards. If these unskilled workers failed to meet his standards, or could be replaced with a cheaper, younger labor force, the owner-manager replaced them. Any attention given to the development of an individual's ability was considered wasteful and time consuming.

As industrial development progressed, the factory became more complex. Specialization, apparent in production, began to promote the separation of ownership and management. Early managers still viewed self-development as an adequate source of skilled labor, and accepted the trial-and-error processing that they had always known. Helpers and common laborers were expected to learn by observing the already

qualified with whom they worked. Only those most capable were promoted. Unfortunately, industry had no concept of job standardization, which meant that a bright, unskilled laborer could be, and was often taught by, the less efficient which reduced his productivity to the company. World War One brought some of the first changes to employer views on employee training. The rapid expansion of industry, the military's manpower needs, and the restricted flow of cheap labor forced many industries to develop training programs for the available labor force. It was not until World War Two that industrial training received its foundation. The United States Department of Education sponsored two programs to develop the skilled resources necessary to support the war effort. They were 1.) Training Within Industry (TWI); and, 2.) Engineering, Science, and Management War Training (ESMWT). Subsequently, these programs were used to establish formal training programs in the post war years. Industry found that, with continued expansion, it could not rely on experience to support the innovations and growth in new fields such as plastics, and electronics. Methods were sought to train available resources as rapidly as possible, and programs were established to promote retention of these resources, once they were trained.

Given the problems and pressures currently confronting Federal organizations, only three resources are available to meet their problems. To a great extent, physical and human resources depend upon the fiscal resources approved by Congress. Since fiscal resources are rarely regarded as plentiful, efforts should be directed towards making more efficient use of resources that are already held. This is especially true for the resource that constitutes the greatest expense - people, their salaries and benefits. Daily we are reminded of the costs of this resource, as salary, retirement, and benefits bills are debated; yet, we

seem tc overlook the potential of increasing the productivity of these same people. Benjamin Mallory, many years a member of the California State Personnel Board, felt that the real job cf managers was to surround their subordinates with all the influences that wculd release the full potentialities of their energies.

Much of the academic effort has been directed tcwards evaluating this general idea. The subsequent work of Argyris, Likert, and McGregor developed and sought to ccnfirm feelings similar to Mallory's. Elton Mayo, as early as 1945, felt that the consequences fcr society cf the imbalance between technical development and social skills were disastrous. Subsequently, as more people became involved in specific facets of affecting change in people, their work was collectively called behavicral science. If employees can really maintain their jobs by working at 20 to 30 percent of their ability, while others will work at 80 to 90 percent of their ability if highly mctivated, [Hersey and Blanchard, p.5] the opportunity costs of frustration, apathy, and resignation are immense. Behavicral science is an attempt to reduce these costs by bringing together, from a variety of disciplines, concepts, theories, and research that may be useful to people in making decisions about the behavior of individuals and groups. In his book, Management of Organizational Behavior: Utilizing Human Resources, Hersey fccuses on four levels of change in people: 1.) knowledge change, 2.) attitude change, 3.) behavioral change, and 4.) group/organizational performance change. This approach was supported by House in , Management Development: Design, Implementation and Evaluation, Bureau of Industrial Relaticns, University of Michigan, in 1967. Changes in knowledge are the easiest to effect, followed by changes in attitudes. Attitude modifications differ from knowledge changes in that they are emotionally charged in a positive or negative way. Changes in behavior are

significantly more difficult and time consuming as seen by Herzberg's work on the hygienic factors that prevent job dissatisfaction, and the motivators that promote superior performance. Group performance changes are the result of collective behavioral changes previously affected. If management is defined as the working with and through individuals and groups to accomplish organizational goals, the importance of behavioral science to organizational managers is high. The greater the managers' awareness and utilization of the improvement means identified by behavioral science, the greater will be his potential to achieve the desired organizational change.

Training is becoming one of the most useful basic tools for increasing the effectiveness of the organization. Much of training's effectiveness is attributed to developments derived from behavioral science knowledge. Previously, many alternatives to training were readily available. The necessary skills could be obtained through a concentrated recruiting program; process and procedures could be modified and reduced to simplier skill needs; and the technical sophistication of the equipment increased to compensate for the skill deficiency of the operator. Today these alternatives are becoming less readily available. The rapid growth of new technologies and the resultant sophistication of equipment and weapon systems have made many effective labor jobs much more complex, creating an increasing shortage of qualified manpower. Simultaneously, the educational quality of high school graduates is being questioned nationally. The Marine Corps, attempting to counter the problems created when non-high school graduates are enlisted, has elected to live with the shortage of qualified manpower rather than contend with a less productive, more abundant work force. The problem has become "how to train" rather than "whether to train".

It no longer is a question of whether the costs of training and development programs can be borne, but one of building a training program that can meet desired goals.

Given the decision maker's ability to set valid attainable goals for his organization, a logical means is required to determine a goal solution. Recent emphasis has been placed on systems theory as a means of providing a logical, thorough approach to problem solving [Hersey, 1977; Kaufman, 1973; Lippitt, 1971; Warren, 1969]. As trite and over-used as it appears, the concept of systems offers the less-experienced a discipline with which to analyze a problem. Whatever the problem, it can be viewed relative to the organization in which it exists. Organizations are recognized as social systems comprised of many inter-related subsystems [Lippitt, p. 97]. Any organization can be viewed as a subset of some more encompassing set of relationships. Each system/subsystem can be viewed in terms of its basic elements: 1.) input, 2.) process, 3.) output, and 4.) feedback. Figure 1 shows an organization that is represented by a systems model.

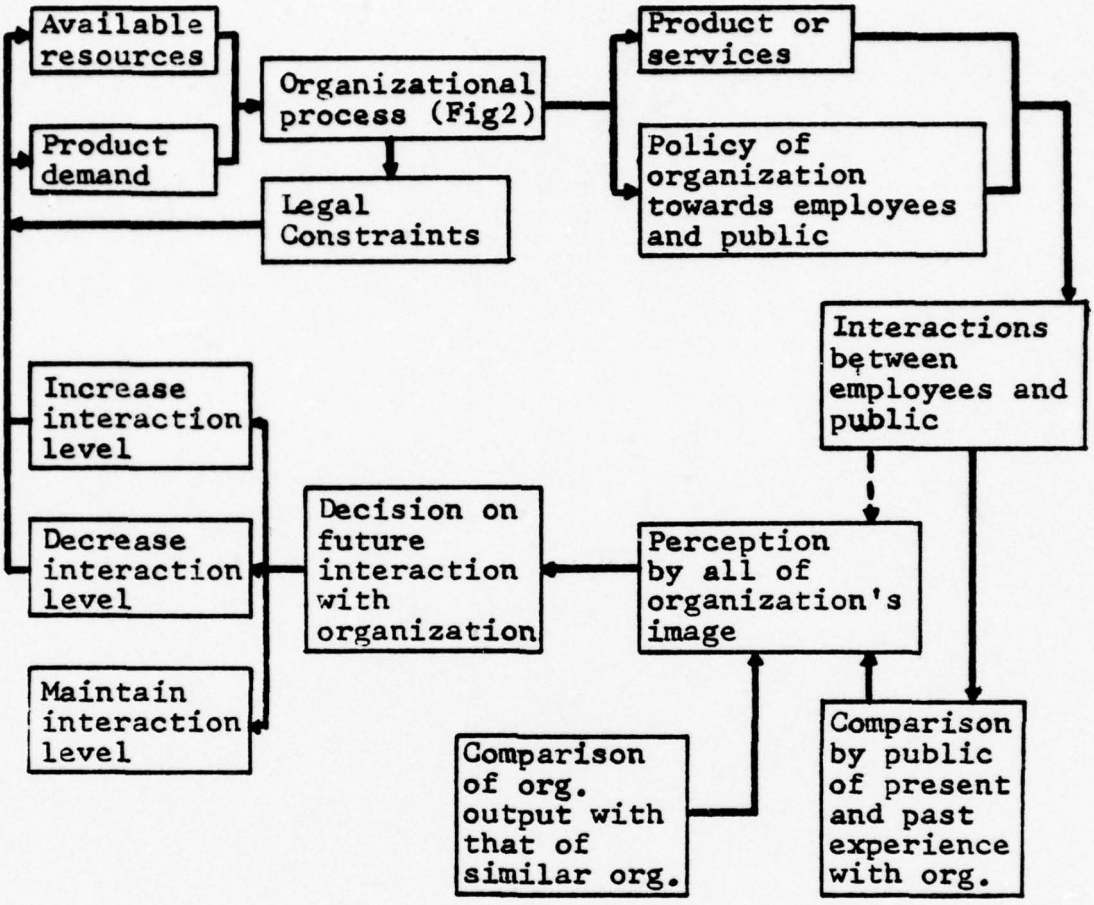

Figure 1 - SYSTEMS MODEL OF AN ORGANIZATION

Figure 2 shows a particular subset of this organization, the organizational process.

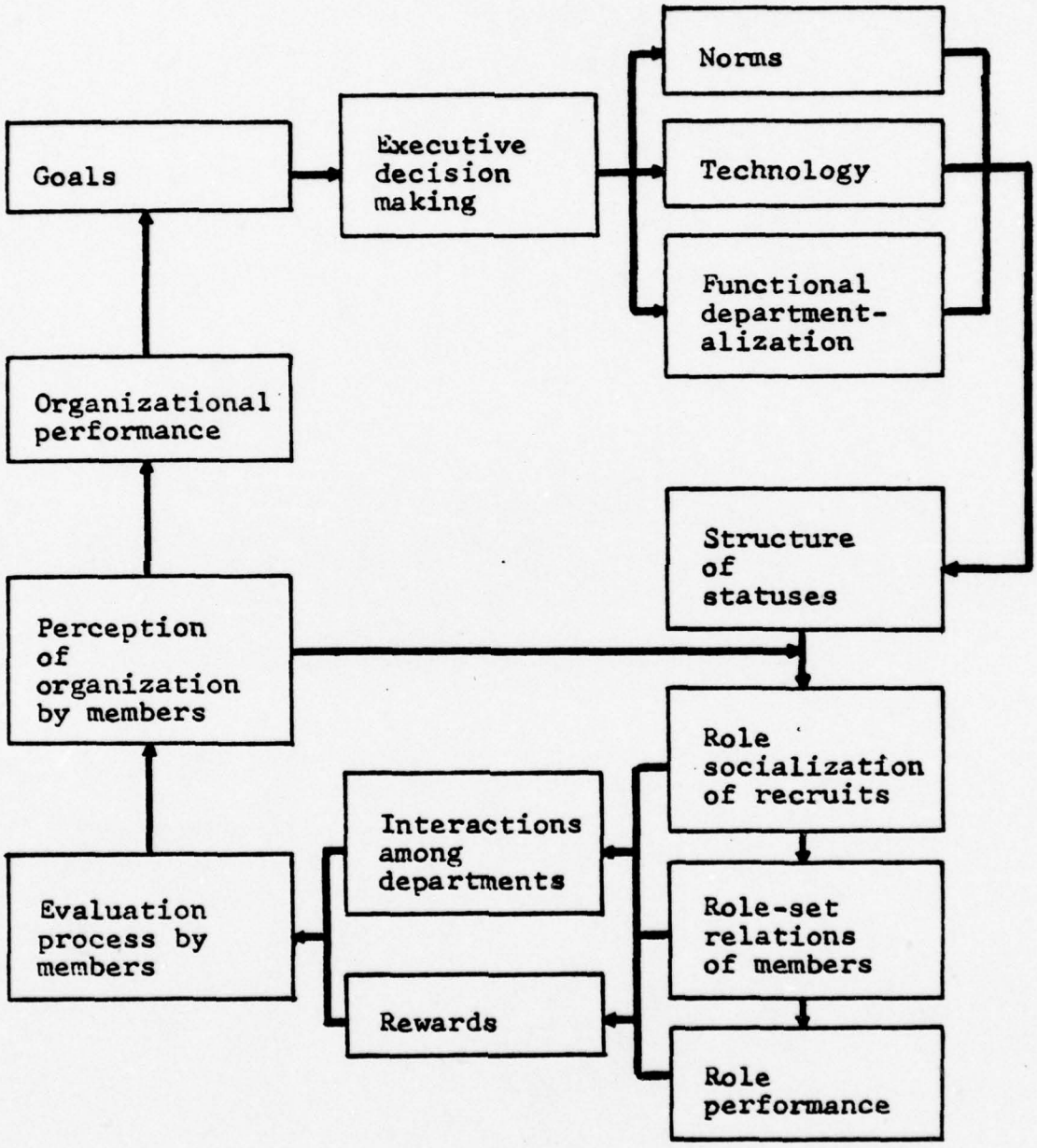

Figure 2 - SYSTEMS MODEL OF THE ORGANIZATIONAL PROCESS

Subsequently, training can be considered as a subset of the organizational process, which through behavioral changes meets its organizational goals. It is a specific subset, one of many tools used to fulfill the larger system's mission. Figure 3 shows a general training model that will be utilized throughout this study [Warren, p. 27].

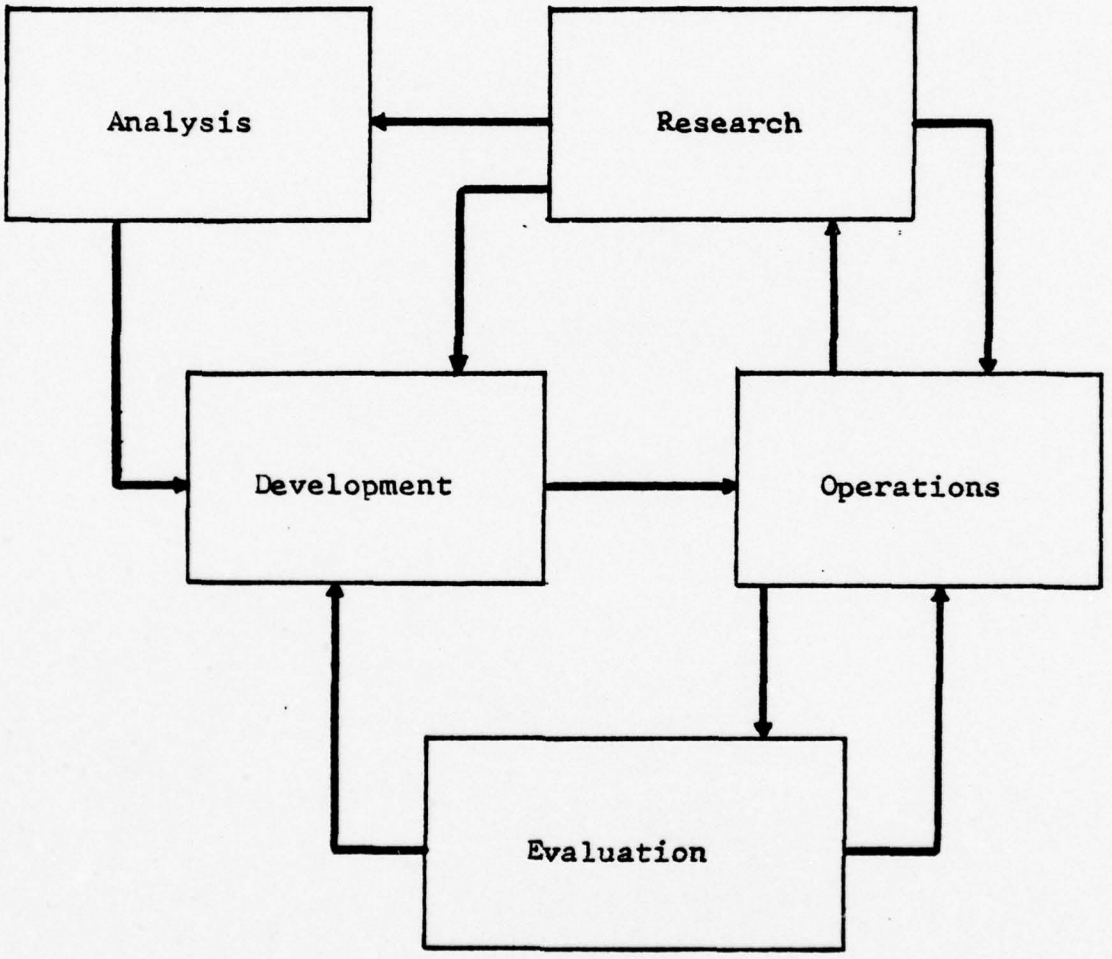

Figure 3 - A GENERAL TRAINING MODEL

The research element provides the training process with data to improve the effectiveness of the organization and trains the remaining elements of the subsystem to maintain the process at the state of the art. It accumulates the developments of specialists in training or other aspects of behavioral science for use in its own system. The analysis element attempts to identify the organization's training needs, evaluate them, and determine from an array of alternatives the solution that provides the necessary behavior or performance required. The development element designs and produces specific training means required to effect the identified change. It would:

1. Utilize available experts in the selection of training methods;

2. Design instruction;

3. Develop lesson plans;

4. Select audio-visual aids, texts, manuals;

5. Contract with external sources when necessary.

The operations element would receive the training means and implement/administer the program. The last element, evaluation, tests the quality of training performance, training program effectiveness, and training system efficiency. The model and its corresponding elements describes those requirements requisite for any training program. It can deal with the skills required during a Marine's career, either collectively or separately. This study will serve as an analysis element for the Marine Corps' organizational aviation maintenance training model. It will attempt to identify the model's training needs, evaluate them, and determine from an array of alternatives the solution.

II. PROBLEM

Marine commanders are held responsible for individual training subsequent to recruit training [Individual Training of Enlisted Marines, Marine Corps Order 1510.2H]. They are to utilize unit schools, formal in-service schools, on-the-job training (OJT), or correspondence cources to conduct individual training; and are expected to individually organize a training system that provides a Marine with the skills, knowledge, and attitudes required to successfully perform all assigned duties and responsibilities. Faced with significant operational loads, and pressed for rescurces to man their units and time to meet their cbligations, commanders and their department heads feel forced to limit the time allocated to training. A recent Naval Postgraduate School thesis [Ccbble and Ulses, 1974] demcnstrated that the identifiable training requirements for a Marine Communications Company were 114% cf the unit's total available man-hours. The individual Marine bears the full impact of the resulting prioritizatcn. This study will attempt to determine the extent that crganizational aviation maintenance training is forgone. The importance of aviation maintenance maintenance training lost is best seen in figure 4. By adding an effective labor level to Hersey's conceptualizatcn of management echelons and their related skill areas, the enlisted Marine's career pattern can be depicted. Technical skill is the ability to use knowledge, methcds, techniques, and equipment necessary for the performance of specific tasks acquired from experience, education, and training. It is technical skill that MCO 1510.2H refers to as individual training.

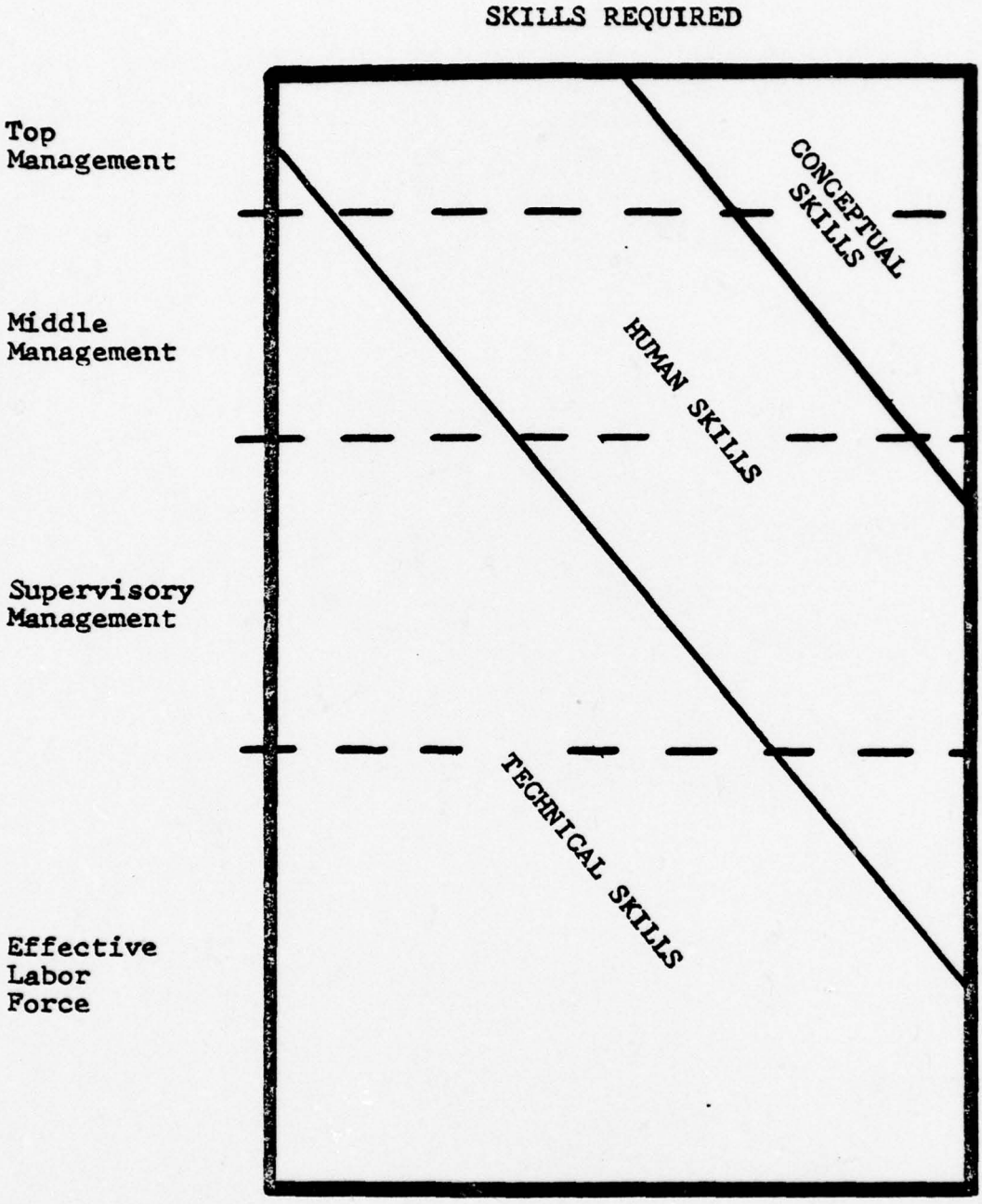

Figure 4 - CONCEPTUALIZATION OF MANAGEMENT ECHELONS AND THE RELATED SKILL AREAS IN AN ENLISTED MARINE'S CAREER

Human skill is the ability and judgement in working with and through people; it must rely heavily on the means identified by behavioral scientists, especially those that affect motivation and promote effective leadership. Conceptual skill is the ability to understand the complexities of the overall organization and how particular elements support that organization. This knowledge allows an individual to act based on the objectives of the whole organization, rather than one's own immediate needs. As seen in the career model, the mix of these skills changes as the Marine advances from a doer, to a checker, to a supervisor, to a manager. It is obvious that a sound technical knowledge, acquired through training, is essential to a Marine's first enlistment and is the basis for further career development.

This analysis will utilize the concepts discussed in the general training model to examine the scope of aviation maintenance training that is currently conducted within a Marine squadron. To the extent that this training is deficient, or not in compliance with the Naval Aviation Maintenance Program [OPNAVINST 4790.2A] and MCO 1510.2H, suitable solution alternatives will be sought.

III. METHODOLOGY

A. GENERAL

This study serves as the analysis element of Warren's general training model [Section I, Figure 3]. The analysis element evaluates the level of training conducted, determines problem areas, and chooses from potential alternatives a solution that will effect the desired change. The remaining elements of the model interact as the cognizant Marine Corps staff functions respond to the inputs generated by this study. R.D. Bock, in Multivariate Statistical Methods in Behavioral Research, identified three broad classes of behavioral investigation. They are: 1.) experiments, 2.) comparative studies, and 3.) surveys. Prediction and classification were considered as portions of decision theory rather than inference, so were not considered to involve interpretational problems. The objective of a behavioral experiment is to demonstrate that by manipulating the conditions to which subjects respond, an investigator can alter behavior in a predictable manner. By varying a single independent varible, he can determine which conditions are necessary for a response to occur, and can justify a causal interpretation. The remaining non-experimental studies can not support such interpretations.

The purpose of a comparative study is to describe differences among existing populations, to identify the processes responsible for differences. Jenner's discovery

of vaccination came from a comparative observation that milk maids had a reduced incidence of small pox when compared to the general public. A survey describes subject responses for a single population, and can identify sources of variation in the data that are associated with specific classes , or subclasses of the population examined. To carry out a survey, a sample is selected from the general population, then subjects are classified according to those characteristics that are to be studied for response variability.

Because of an inability to control any independent variable, a combination survey and comparison was utilized. A survey was used to determine the level of organizational maintenance training within Marine aviation. The Marine Aircraft Wing (MAW) is the largest deployable command in Marine aviation. There are three active-duty MAW's, each in support of a Marine division. A typical aircraft wing organization is depicted in figure 5. Due to financial limitations, sampling was restricted to the two Wings within the United States. The Second Marine Aircraft Wing (2nd MAW) is located in North Carolina, and the Third Marine Aircraft Wing (3rd MAW) is located in California and Arizona. The squadron is the basic tactical and administrative unit of Marine aviation, and is authorized to conduct the lowest of the three levels of aircraft maintenance, organizational maintenance. Therefore, squadrons were selected randomly within a MAW to survey the general population of Marine aviation. Selection of a dependent variable will be discussed in Section IIIC, Respondents. Comparitive studies involved two subclasses of the population. These studies test the statistical significance of: differences between samples taken from the 2ndMAW, and those taken from the 3rdMAW, and differences in perception between members of the organizational maintenance effort.

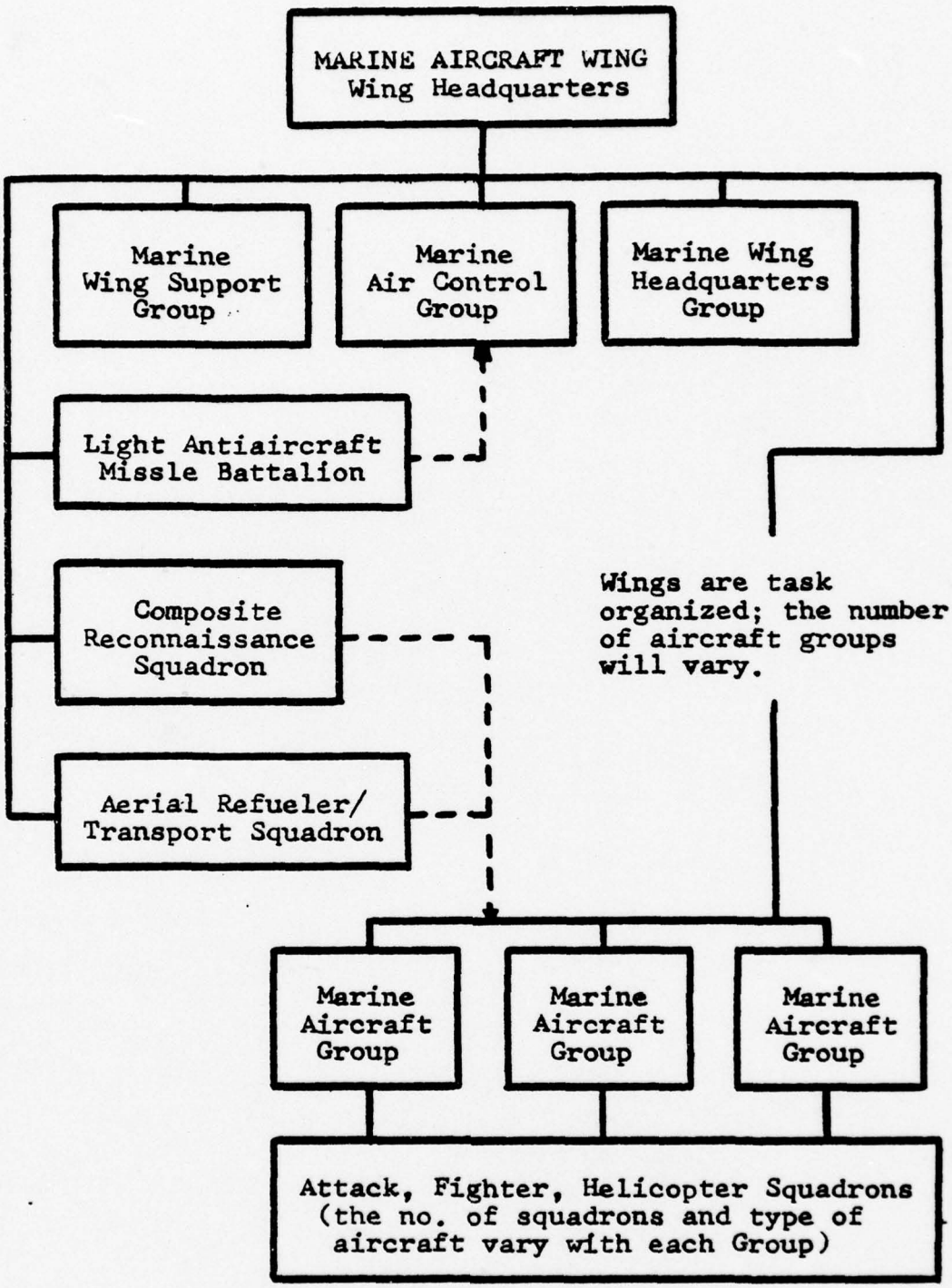

Figure 5 - MARINE AIRCRAFT WING

The term survey will subsequently describe the overall approach of this analysis.

Payne in, The Art of Asking Questions, reported the results of asking a sample of researchers what they saw as the principle problems with research methods. The results were:

1. Improperly worded questionnaires (74%),
2. Inadequacy of samples (52%),
3. Faulty interpretation (58%),
4. Improper statistical methods (44%),
5. Presentation of results without supporting data (41%).

This survey was conducted with these problems in mind. The subsequent portions of this section will cover the four most significant of these problems. The Analysis Section will deal with the fifth problem.

B. ORGANIZATIONAL AVIATION MAINTENANCE TRAINING MODEL

The Marine Corps' order on individual training (MCO 1510.2H of July, 1974) provides policy guidance and implementing instructions to commanders for the individual training of enlisted Marines. Figure 6 shows the elements of this training model. The survey looks at those components of individual training identified by MCO 1510.2H when applied to squadron-level maintenance training. Entry-level training consists of recruit training and military occupational speciality (MOS) training. Squadron commanders are only able to influence MOS training through an effective MOS qualification program.

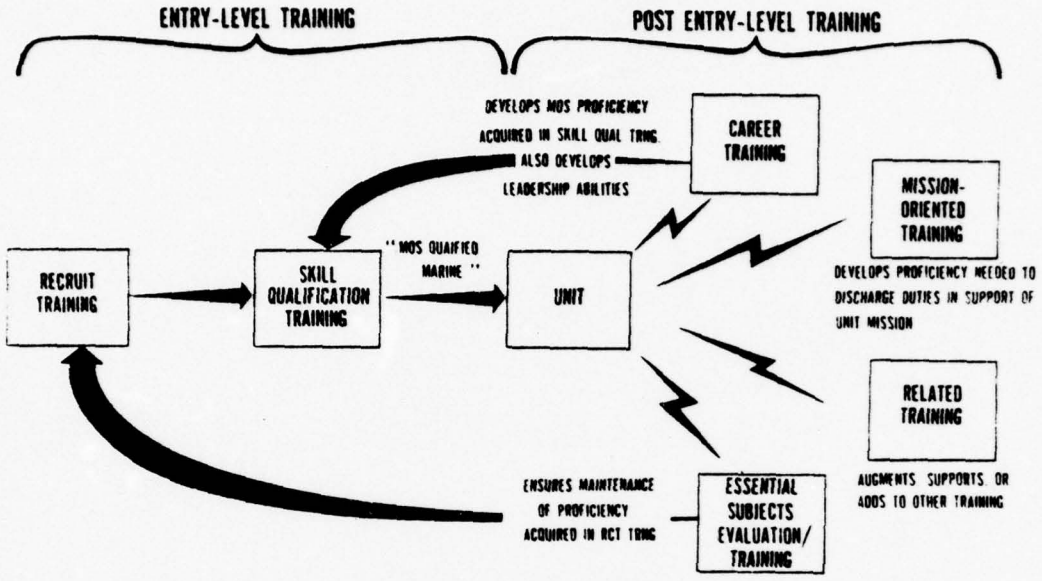

Figure 6 - INDIVIDUAL TRAINING MODEL FOR ENLISTED MARINES

Due to previous abuses of timely individual qualification programs, the concept of a trainee management unit (TMU) and its subordinate trainee management element (TME) was implemented to assure efficient, effective entry-level training. Post entry-level training consists of:

1. Mission oriented training that provides the skills, knowledge, and attitudes necessary to discharge the expected duties that support the squadron's mission;

2. Career training that provides the skills, knowledge, and attitudes necessary for increased grade and responsibility;

3. Essential subjects training/evaluation that ensures that all enlisted Marines maintain a desired level of proficiency in those areas prescribed by the Commandant of the Marine Corps;

4. Related training that provides programs in human relations, drug and alcohol abuse, safety, and other troop information programs.

Only mission oriented and career training involve organizational maintenance training directly. The sources for this training are: technical training, on-the-job training, individual study, and formal schools. Indirectly, the amount of time and people obligated to mandatory essential subjects evaluation and related training affects the time allocated to maintenance training, given a significant maintenance load. The following areas are considered requisite for understanding the quality of organizational maintenance training:

* MOS qualification,
* IMU/IME management of unqualified Marines,
* Technical training,
* On-the-job training (OJT),
* Individual study,
* Formal schools.

The survey was designed to inquire into these areas.

C. RESPONDENTS

Initially a quantifiable dependent variable was sought that would provide interval data with which to measure the quality of organizational maintenance training that is conducted. Man-hours consummed for specific maintenance actions was too dependent on:

1. type of aircraft,

2. variances in maintenance action documentation,

3. work priorities,

4. effective labor force on hand,

5. operational load,

6. non-operational commitments,and

7. political pressures to report maximum readiness,

to be useful. The rate of components tested by an intermediate maintenance activity (IMA) and found to have no defect was not only indicative of squadron maintenance quality, but that of the IMA technician and the calibration of his test equipment. Thus, a survey was developed to identify aggregate maintenance personnel response. People from all levels of the squadron maintenance effort were asked to value, estimate, and express their thoughts openly about the quality of aviation maintenance training conducted in their squadrons.

Squadrons from each Wing were randomly selected. All the squadrons for a Wing were written on identical cards and placed in a bag. Squadrons were drawn from the bag and assigned the number of their sequence in the drawing. A random number table was used to identify six squadrons from each Wing. Data gathering was limited to a week with each Wing due to concurrent coursework. Each squadron consumed a complete day, which resulted in data from a total of ten Marine squadrons. Two of the 2ndMAW squadrons were operationally committed; these choices were discarded and replaced randomly. Seven of the eleven type aircraft in the Marine Corps's inventory were eventually involved in the survey. While only two aircraft were helicopters, they involved four of the ten squadrons sampled.

To provide a thorough survey of squadron maintenance training, commanding officers, the aircraft maintenance officer (AMO), work center supervisors (staff non-commissioned officers), and Marines, Sergeant to Pfc, working in a maintenance MOS were interviewed from the same squadron. To promote trust and response confidentiality, commanding officers were always interviewed first, then maintenance officers, then work center supervisors, then enlisted Marines. No feedback was given to any previous participant, a fact strongly stressed in the interview. Since the squadrons were already selected randomly, so were their commanding officers, and maintenance officers. All enlistedmen were randomly selected from maintenance personnel rosters by the interviewer. Three work center supervisors per squadron were selected because this represented approximately 50% of the major production work centers within a squadron's maintenance department. The number of enlisted Marines (Pfc to Sergeant) interviewed was dependent on time remaining in the day. In all but one squadron, four Marines were interviewed per squadron. Table I provides a breakdown of the enlisted Marines interviewed between July 1977 and August 1977.

WING	**********	RANK	**********	*TOTAL*
	Sgt	Cpl	L/Cpl and Pfc	
2ndMAW:	6	6	7	19
3rdMAW:	7	5	8	20
TOTAL:	13	11	15	39

Table - I RANK BREAKDOWN BY WING OF ENLISTED MARINES SAMPLED

A Kolmogorov-Smirnov test would not reject the null hypothesis of random distribution of ranks at even a .2

significance level. A total of 89 individuals were interviewed in ten squadrons; a sample size that is sufficient for parametric, or nonparametric inference. Table II provides a breakdown of the total sample taken.

WING	********** SQUADRON POSITION **********				*TOTAL*
	COMMANDING CFFICER	MAINTENANCE OFFICER	WORKCENTER SUPERVISOR	ENLISTEDMEN Sgt to Pfc	
2ndMAW:	5	5	15	19	44
3rdMAW:	5	5	15	20	45
TOTAL:	10	10	30	39	89

Table - II SAMPLE BREAKDOWN BY SQUADRON PCSITION AND WING

D. RESEARCH INTERVIEW

Initially, a questionnaire was conceived as the means of sampling all Marine Aircraft Wings about aircraft maintenance training. Because of concern for prcblems associated with:

* Inadequate response to the questionnaires distributed,
* Squadron induced bias,
* Uncontrolled respondent selection,
* The potential compromise of question sequence,
* Respondent comprehension,
* Respondent motivation,

the research interview was selected as the survey's data collection method. A research interview is a two-person conversation that is initiated by the interviewer for the specific purpose of obtaining research-relevant information. It is a process that includes at least five discrete steps

[Cannell and Kahn, Reference 11, p. 527]. They are:

1. Creating or selecting an interview schedule, and a set of rules or procedures for using the schedule;
2. Conducting the interview;
3. Recording these responses;
4. Creating a numerical code for the recorded responses;
5. Coding the interview responses.

An interview schedule can be any set of questions, statements, pictures, or other means to evoke a set of responses. The questionnaire in Appendix A was developed for interview consistency and economy of time. The Human Resources Research Organization's report, RBP-D4-70-1, "Guide for Developing Questionnaire Items," and the second edition of, The Handbook of Social Psychology, Vol. 2, pages 552 to 571, provided the guidance for the questionnaire's preparation. Open, two-way, and multiple-answer questions were used for a topic area to promote response completeness. A value scale from five to one was used to show general direction and magnitude. A smaller interval scale (nine to one) was not chosen because of the dilution of expected frequencies for any given cell. Questions were sequenced to avoid potential bias from a previous response set, and were limited to single questions of a simple nature. A pre-test was conducted in three stages to eliminate unnoticed bias during question formulation, improve question clarity, and to ensure reception of desireable information. The initial questionnaire was reviewed by a qualified researcher for general construction. Subsequently, three Marine aviators (two had previous maintenance backgrounds, one did not) provided only minor changes to improve question clarity. Finally, two Staff NCO's with extensive maintenance

backgrounds were interviewed individually by telephone to validate the questionnaire's ability to provide the necessary information. The validated questionnaire was duplicated so that each respondent would ultimately be represented by a completed questionnaire.

A set of rules and procedures developed into a brief introduction that was given to each respondent. Tone and opening remarks were appropriate for the billet interviewed and perceived respondent attitude. The length was dependent upon the time necessary to get each person into a trusting, relaxed, and willing attitude. The format for this introduction was:

* Interviewer identity and purpose;
* The reason for this research - to identify aggregate feelings for current maintenance practices and the level of Marine Corps' support;
* Briefing on the questionnaire itself:
  ** a means to ask everyone the same question,
  ** a quick way to interview each person, without wasting their time,
  ** the types of questions encountered,
  ** the respondent's role, what was expected of the respondent,
  ** to ask questions freely during the interview to to clear up any unclear words or meanings;
* Process of selection - random selection by the interviewer from a maintenance roster;
* No identification of the squadron, type aircraft, or individual to promote open, honest response through anomity,
  ** the interview sequence allowed no feedback to any person, superior or contemporary, all

responses were completely confidential;

* To reinforce the concept of true individual response:
  ** all comments are solicited, even for fixed choice questions,
  ** prefer how people actually feel, rather than being limited by a question's conceived answer.

Initial correspondence with the squadrons to be sampled avoided any reference to maintenance training. The squadrons were told that the interview dealt with aircraft operational readiness to avoid response bias to question number four, which sought whether training would be listed voluntarily as a significant factor to aircraft readiness, or not. The interviews were conducted privately, as briefed, and without interruption. Each question was read and explained as necessary. It was found that neutral explanations of questions provided the most difficulty of any portion of the survey sequence.

The coding of response frequencies was done after all interviews were completed. A contingency matrix was developed for each question by Wing, and by squadron position to aid the application of the appropriate nonparametric test.

E. NONPARAMETRIC STATISTICAL INFERENCE

Statistical inference is concerned with two types of problems: estimation of population parameters, and tests of hypothesis. This survey utilizes the latter type, hypothesis testing, to draw conclusions about a large number

of people on the basis of observations from a portion of them. A common problem for statistical inference is determining (through probability) whether observed differences between two samples signify that the populations sampled are different. Since differences do occur by chance, statistical inference enables the sampler to determine whether the observed differences are within the range that could easily occur by chance, or whether it is so large that it signifies that the two samples are probably from two different populations. Another common problem is to determine whether it is likely that a sample of scores is from a specified population, or whether several groups differ among themselves.

Statistical inference uses parametric and nonparametric tests to reach a decision about an hypothesis. Parametric tests are the most powerful, but, they have the strongest, most extensive assumptions. The t and F tests have a variety of strong assumptions. When these are valid, the tests are the most likely of all tests to reject the null hypothesis when it is actually false. However, the research data must be appropriate for the test. Conditions for the t-test are [Boot and Cox, p. 583]:

* The observations must be independent;
* The observations must be drawn from distributed populations;
* These populations must have the same variance;
* The variables must have been measured on at least an interval scale, so that arithmetic operations can be applied to the scores.

All of the above are elements of a parametric statistical model. These conditions are not normally tested, but, are assumed to be true.

A nonparametric test is a statistical model that does not specify conditions about the population parameters. They do not require interval data, but, can significantly test ordinal and nominal data. Since parametric tests use means and standard deviations that require arithmetic operations on the original data, they should not be used with data of an ordinal scale. The properties of an ordinal, or ranked scale are not isomorphic to arithmetic operations [Siegel,p.26]. Because the data collected is ordinal at best, nonparametric tests will be used in this analysis. The advantages of nonparamertic tests are:

* Probability statements are based on exact probabilities, except in the case of large sample sizes, and are not dependent on assumptions about the shape of the population distribution;
* Where sample sizes as small as N=6 are used, there is no alternative to a nonparametric test;
* Parametric tests can not handle several samples from different populations;
* Nonparametric tests can handle ranked data (ordinal), or classificatory data (nominal) that parametric tests can not deal with.

The disadvantages are:

* If all the assumptions are met in the data, parametric tests can provide a result with a slightly smaller sample size; this difference is generally between four to ten percent of the sample size;

* The problem of higher-ordered interactions in the analysis of variance model requires special assumptions about additivity, and has yet to be dealt with as a portion of the nonparametric model.

The specific nonparametric test applied to a question was determined by the type of data and hypothesis to be tested. The nature of the data did limit the number of tests utilized, they were:

* Chi-Square Test,
* Kolmogorov-Smirnov Test,
* Mann-Whitney U Test,
* Kendall Coefficient of Concordance: W,

Siegel's book, Nonparametric Statistics for the Behavioral Sciences, published in 1956, was the reference for all test applications.

1. Chi-Square Test

Of the available nonparametric tests, the Chi-Square, one and two sample tests were used where response frequencies were collected in unranked classifications for one and two independent samples. The technique tests for a goodness-of-fit between observed category responses, or when an observed response is compared to a theoretical response distribution for randomness. Each observed frequency was compared to an expected frequency for the same conditions. The expected frequencies were computed by dividing the product of the respective marginal totals for each cell by the total number of observations in the sample. The computed value of Chi-square is indicative of the agreement between the observed values and the expected frequencies for that condition. The Chi-square value is then compared to the critical value for the appropriate degrees of freedom and desired significance level, to

determine the outcome of the test. Literature does not contain much information about the power of the Chi-square test, since it is used when no clear alternatives are available [Siegel, pages: 42-47, 104-111, 175-179].

2. Kolmogorov-Smirnov Test

The Kolmogorov-Smirnov tests for one and two independent samples are also concerned with the degree of agreement between two distributions. The cumulative frequency distributions (cfd) are compared to yield difference values for each ranked category. The greatest observed difference (D) for any category is compared to the critical value for the desired significance level. The Kolmogorov-Smirnov test is applicable for very small samples, when the Chi-square test can not be applied. Additionally, the Kolmogorov-Smirnov test will reject a hypothesis for identical data when the Chi-square test will not. This demonstrates that the Kolmogorov-Smirnov is a more powerful test than the Chi-square test [Siegel, pages: 47-52 and 127-136].

3. Mann-Whitney U Test

When at least ordinal measurement has been achieved, the Mann-Whitney U test may be used to test whether two independent groups have been drawn from the same population. It is one of the most powerful nonparametric tests, and serves as an alternative to the parametric t-test. The test measures sequential differences between two samples. The test statistic U is the number of times that a score in one sample precedes a score in another sample. It is then compared to a critical value for the desired significance level [Siegel, pages: 116-127].

4. Kendall Coefficient of Concordance: W

The Kendall coefficient of concordance provides a measure of the relationship among rankings of several choices by individuals. It serves as an index of the divergence/agreement between observed sets of rankings. Choice rankings are summed to yield a sum of squares of the observed deviations from a mean value of choice rankings. The sum of squares is subsequently divided by:

$$1/12\ k^2(N^3-N)^2$$

to generate the index of the agreement between set rankings. The variable k is equal to the number of sets of rankings; the variable N represents the number of items/choices that are ranked. A value less than, but close to one would indicate that the respondents valued each item similarly. It does not indicate that the rankings are correct, only that the respondents are applying essentially the same standards. Kendall also suggests that the best estimate of the "true" rankings of N objects is provided, when the coefficient is significant, by the order of the various sums of ranks for each item considered [Siegel, p.238].

IV. SURVEY ANALYSIS

A. MARINE AIRCRAFT WING DIFFERENCES

The survey was originally designed as a sequence of two-way tests that were to be taken from a single independent sample of organizational maintenance activities. Because of perceived differences in monthly operational readiness percentages and average monthly flight hours flown for squadrons of the two MAW's, tests were conducted to see if the differences were statistically significant. Specific readiness percentages and monthly flight hour averages are not shown to keep the analysis unclassified. The Mann-Whitney U test found that the 3rdMAW operational readiness was statistically greater than that of the 2ndMAW, at a significance level of .008; the 3rdMAW squadrons also had statistically greater monthly flight hour averages than those of the 2ndMAW, at a significance level of .012. Due to the high probability of a difference existing, survey factors that could be influenced by association with a particular MAW were tested for a Wing effect. Of the nine questions that dealt with local estimates and values, only two questions had responses that were statistically different for the two MAW's at a significance level of .01.

The frequency of technical training held was different at a significance level of .001 (Kolmogorov-Smirnov). Table III shows the frequency and resultant cumulative distribution of monthly frequency estimates for each MAW.

WING	**********	MONTHLY FREQUENCY	**********	**********
	≤1	2	3	≥4	*TCTAL*
2ndMAW:	16	15	6	7	44
3rdMAW:	5	7	0	3	45
TOTAL:	51	22	6	10	89

Cumulative Frequency Distribution:

	≤1	≤2	≤3	>3
2ndMAW:	.364	.705	.841	1.00
3rdMAW:	.778	.933	.933	1.00

Table - III DISTRIBUTION OF OPINION ON MONTHLY TECHNICAL TRAINING FREQUENCY

Cnly 36% cf the 2ndMAW respondents reported that technical training was held once a month or less, while 78% cf the 3rdMAW respcndents repcrted the same frequency. A technical training lecture was defined for each respondent as a session that took 45-60 minutes to conduct, and was given from some fcrm of prepared lesson guide. Even for technical training held twice a month or less, 93% cf the 3rdMAW respondents had been accounted for, compared to only 70.5% cf those frcm the 2nd MAW.

The formality estimates for existing cn-the-jot wcrk center training programs were also statistically different at a .01 significance level (Kclmogorov-Smirnov). Table IV shows the frequency and cumulative frequency distributions for OJT program formality estimates. Each respondent was asked to rate the formality of his work center's OJT program on a scale of five to one. A value cf five would indicate the most formal of any program.

WING	***** OJT PRCGRAM FORMALITY LEVELS ******					*TCTAL*
	1	2	3	4	5	
2ndMAW:	15	15	10	1	3	44
3rdMAW:	12	12	5	13	3	45
TOTAL:	37	37	15	14	6	89

Cumulative Frequency Distribution:

	≤1	≤2	≤3	≤4	≤5
2ndMAW:	.34	.68	.91	.93	1.00
3rdMAW:	.27	.53	.64	.93	1.00

Table - IV RESPONSE DISTRIBUTION OF OJT PRCGRAM FORMALITY ESTIMATES

Formality was defined as a precise program that utilized a logical, written syllabus and was organized for a specific MOS and aircraft. The statistical significance of the Wing differences results from the 29% of the 3rdMAW respondents who estimated OJT program formality as a four, while 91% of those frcm the 2ndMAW rated OJT formality as a three or lcwer.

B. TRAINING AS A FACTOR OF AIRCRAFT READINESS

Before respondents were exposed to any mentiон of maintenance training, they were asked a question that was to determine whether training was felt to be a significant factor of aircraft readiness. Each person had to list the most significant factors that they felt affected aircraft availability. Even thcugh they could list five factcrs, cnly two listed all five; the remaining 98% listed fcur or less factcrs. The resultant frequency that training and

factors that could be generalized as training were mentioned as a significant factor was compared to the frequency of it not being mentioned. To apply the Chi-square test, significance positions were aggregated to generate cell expected frequencies of acceptable sizes; total enlisted response was compared to total officer response, rather than a comparison between specific positions. To use the Chi-square test, 20% of the frequency matrix's cells have to have expected values that are equal to, or greater than the value of five. A Chi-square value of 4.68, with three degrees of freedom, showed a statistical difference between positions that indicated training was a factor and those that did not , at a .2 significance level.

FACTOR POSITION	******* SQUADRON POSITION ******				*TOTAL*
	CC	AMO	SUPV	ENL	
1	0	3	6	5	14
2	3	2	7	5	17
3	1	3	3	6	13
4	1	0	3	2	6
No Mention	5	2	11	21	39
TOTAL:	10	10	30	39	89
Signif. Factors As % of Total:	50%	80%	63%	46%	56%

Table - V RESPONSE DISTRIBUTION OF TRAINING AS A SIGNIFICANT FACTOR OF AIRCRAFT READINESS

Of the maintenance officers sampled, 80% indicated that training was a factor; 30% of them rated training as the most significant factor. On the other extreme, 50% of the commanding officers and 46% of the Marines (Sgt and below) indicated that training was a significant factor (Table V). The larger enlisted sample (39) certainly influences the 56%

aggregate response for training as a significant factor. Of the 39 respondents who did not indicate that training was a factor, seven of the eleven (64%) of the work center supervisors, and 18 of the 21 (86%) enlistedmen indicated that morale and enlistedmen's attitude was the most significant factor. This response, when aggregated, was 64% of the total who had not mentioned training as a response.

C. ENTRY-LEVEL TRAINING

Since recruit training is beyond the scope of this survey, consideration of entry-level training was restricted to problems associated with MOS qualification. The survey was structured to collect organizational perceptions about the TMU/TME program and squadron generated MOS capable training. MOS capable training includes formal technical training and on-the-job training.

Each respondent was initially asked to estimate the productivity of Marines completing the local TME to acquire a general feel for the basic product received by a maintenance department. An individual that is 100% productive was defined as one who is capable of solving, when unsupervised, normally encountered discrepancies, and is qualified for a collateral duty inspector (CDI) designation. A CDI is an individual who has demonstrated that he is knowledgeable in his MOS and aircraft, and is qualified to inspect the work of others as specified in CPNAVINST 4790.2. While all enlisted response, supervisors and junior Marines, was MOS specific, all officer response represented aggregate impressions of individual productivity.

The consistency of the response by either aircraft Wing or squadron position supports the concept of a general level of productivity (Table VI). The Mann-Whitney U test could not find a statistical difference at the .2 significance level.

WING	********* SQUADRON POSITION *********				*TOTAL*
	CO	AMO	SUPV	ENL	
2ndMAW					
Mean :	58.0%	35.0%	38.6%	42.1%	43.4%
Std Dev:	16.4%	15.4%	21.6%	19.9%	18.3%
3rdMAW					
Mean :	60.0%	44.0%	44.7%	43.9%	48.2%
Std Dev:	10.6%	13.4%	26.5%	20.3%	17.7%
AGGREGATE					
Mean :	59.0%	39.5%	41.7%	43.2%	44.0%
Std Dev:	13.1%	14.4%	24.0%	19.9%	20.7%

Table - VI AGGREGATE ESTIMATES OF PRODUCTIVITY SUBSEQUENT TO THE COMPLETION

Commanding officers were above all other sources. Of the commanding officers interviewed, 40% of them had less than a year's total experience in aircraft maintenance. Their estimates were the highest (80%, 75%, 70%, and 65%) of commanding officer estimates. Throughout the survey, commanding officers without maintenance experience could not respond to open questions about specific areas of aviation maintenance training, and openly admitted that many of their responses were merely guesses. If these officers had experience in aircraft maintenance, their responses would have been consistent with the balance of maintenance-experienced responses, whose means varied between 39.5% and 43.2%.

To determine a general feeling for the time usually required to acquire the balance of mission capable productivity, enlistedmen were asked to: 1.) estimate the time that a newly qualified Marine requires before he can handle tasks that are specified for his MOS and rank without direct supervision; and 2.) estimate the time required for qualification as a collateral duty inspector (100% productive). The Kolmogorov-Smirnov tests could not identify a statistical difference at a .2 significance level, but did show that the response was not random at a .001 significance level. The cumulative frequency distribution shows that 97% of all enlisted respondents felt that Marines would qualify for unsupervised work within nine months; 43% felt that a Marine would qualify within three months of his MOS assignment; and all felt that it would take no longer than a year to work unsupervised (Table VIII). Estimates on time to become 100% productive (CDI) never exceeded two years, 81% of those sampled felt that a CDI qualification would generally require 18 months or less.

RESPONDENT	**********	TIME IN MONTHS	*********	*TOTAL*
	≤3	6	9	12	
2ndMAW					
Supervisor:	6	6	1	1	14
Sgt to Pfc:	6	10	3	1	19
Total:	12	16	3	2	33
3rdMAW					
Supervisor:	8	4	3	0	15
Sgt to Pfc:	9	8	2	0	19
Total:	17	12	5	0	34
AGGREGATE					
TOTAL:	29	28	8	2	67

Cumulative Frequency Distribution:

	≤3	≤6	≤9	≤12
Supervisor:	.48	.83	.97	1.00
Sgt to Pfc:	.39	.87	.97	1.00
Aggregate :	.43	.85	.97	1.00

Table - VII RESPONSE DISTRIBUTION OF ENLISTED ESTIMATES OF TIME REQUIRED BEFORE ASSIGNMENT OF UNSUPERVISED WORK

When work center supervisors and Marines, Sergeant and below, were asked whether the TME system qualified Marines for their MOS, 83% of the work center supervisors and 66% of Marines responded with the answer, "No." The difference was significant at .1, but it is attributed to an age and experience differential between the junior enlistedmen and those their senior. It is also significant that 73% of all enlistedmen interviewed felt that the TME system did not prepare Marines for their MOS qualification.

This response is consistent with the valuation estimates of TMU/TME support for an individual's MOS. Enlistedmen

were asked to value the qualification process provided by the TMU and its local TME's. On a scale of five to one, five represented a process that was highly efficient in providing a useful MOS product. One represented a very inefficient program. While the Kolmogorov-Smirnov tests could not support a statistical difference between the MAW's or squadron positions, it did show a difference from randomness at the .01 significance level. The cumulative frequency distribution of Table VIII shows that 79% of all enlistedmen sampled rated the TMU/TME system a value of two or less, with 49% of them rating the system a value of one or less.

RESPONDENT	*VALUE ESTIMATE OF PROGRAM SUPPORT*					*TOTAL*
	1	2	3	4	5	
2ndMAW						
Supervisor:	6	4	3	1	0	14
Sgt to Pfc:	7	7	4	1	0	19
TOTAL:	13	11	7	2	0	33
3rdMAW						
Supervisor:	11	2	0	2	0	15
Sgt to Pfc:	9	7	1	2	0	19
TOTAL:	20	9	1	4	0	34
AGGREGATE						
TOTAL:	33	20	8	6	0	67

CUMULATIVE FREQUENCY DISTRIBUTION:

	≤1	≤2	≤3	≤4	≤5
Supervisor:	.59	.79	.90	1.00	
Sgt to Pfc:	.42	.79	.92	1.00	
Aggregate :	.49	.79	.91	1.00	

Table - VIII FREQUENCY DISTRIBUTION OF TMU/TME SUPPORT VALUATION

Answers to open questions and voluntary responses supplemental to the closed valuation questions provided a more complete picture of the MOS qualification program. Responses and voluntary comments were initially collected by type of source. Each response was written once, then checked when repeated by another respondent. The responses of greatest frequency were common to all types of respondents, they are, in order of frequency:

1. People are trained to work on a specific aircraft, only to be sent to work on another type of aircraft. One work center supervisor documented ten consecutive instances of this abuse. This problem is most significant in those MOS's that are not aircraft specific. The validity of initial OJT was questioned when it takes an estimated six months to qualify an ordnanceman on a different aircraft. Because of the lack of identity with any squadron and the potential for an aircraft shift upon assignment of a hard skill MOS, all junior enlistedmen indicated that enthusiasm to learn an aircraft was low until Marines were either certain of squadron retention, or finally assigned to another squadron.

2. The local TME's generate undue turbulence that reduces the efficient, effective training that they are tasked to promote. People were required to muster at their TME three times daily; do the benefits of administrative control outweigh the costs of OJT forgone when squadrons can provide adequate daily control? Several comments questioned the need for a 1600 muster when the heaviest, most technical maintenance was performed well into early evening. Operational loads generally require that the bulk of the actual maintenance be performed subsequent to daily

flight operations. Additionally, Marines indicated that they had been drilled in the evening and at night, which not only reduced opportunities to study, but reduced any interest in learning to an attitude of "just coping with the Marine Corps." Others addressed frequent interruptions throughout their training day, to sign a form or audit a computer printout, that could have easily waited until the subsequent TME muster, or a suitable administrative period.

3. Improper management of the qualification program. Of the enlistedmen interviewed, 80% felt that each new Marine should spend from two to six weeks on the aircraft that he will be working on prior to attendance of any formal technical school. The period varied with the nature of the respondent's MOS. Presently, many Marines attend their initial A school before any exposure to an aircraft, which results in lower retention of the technical knowledge and lower initial productivity. While some respondents did remember a checklist "of sorts," that they received from their supervisor prior to their assignment to a squadron, no one was ever counselled on its contents or the extent of their qualification training. Of the 39 junior enlistedmen questioned, two indicated that 50% of their checklist was signed-off without any instruction or training being performed. Only one had felt that he had completed all of the checklist. Most supervisors felt that the checklist was too general for their purposes, but only two could provide a specific outline that new Marines were qualified with. Of all the enlistedmen sampled, 72% of them indicated that they would like to see a more structured qualification program that was in fact monitored to maintain quality of output. All respondents indicated that they preferred to train their own due to the poor quality of

MOS qualification from some of the other squadrons, but would like to see some means of standardizing the qualification program for their MOS and aircraft. Presently, there is no training quality assurance conducted; much time is spent washing aircraft and cleaning hangers. Aside from local pride, examples of 12 day OJT periods, 50% checklist write-offs, and a marked variance in the quality of OJT for trainees, supports additional interest in the quality of the current MOS qualification program.

D. POST ENTRY-LEVEL TRAINING

The training that a Marine receives after his assignment to a unit, to maintain and develop maintenance proficiency acquired during his entry-level training is composed of technical training, on-the-job training, and formal technical schools. Since formal technical schools are not within the scope of this study, only organizational technical training and on-the-job training will be considered directly.

1. Technical Training

OPNAVINST 4790.2A provides a program for organizational technical training. It defines technical training as training conducted through lectures, supplemented with visual aids, and required reading. A training schedule is published in the monthly maintenance plan for all work centers. The lectures are prepared by designated officers, SNCO's, and other technically qualified persons. A lesson guide is prepared by the instructor for each class.

Technical training should be conducted by the work centers at least an hour per week. Individual records are maintained to document the training received.

Each squadron had a well documented training program that complied with the appropriate references. Monthly maintenance plans showed detailed training schedules, and individual records showed consistent technical training held. In three of the work centers, individual records were completed through the end of the month, even though no training had been physically held for the particular month (July, or August). Respondents were asked for the monthly technical training frequency for training actually held in their respective work centers and departments. As previously mentioned, the 2ndMAW/3rdMAW frequencies were statistically different at a .001 significance level. Within the 3rdMAW sample, 78% felt that a one hour training lecture was held once a month or less. One Marine said that he had had a total of three technical training sessions in two years. Within the 2ndMAW sample, 71% indicated that technical training was held twice a month or less (36% indicated a frequency of once a month or less). The Kolmogorov-Smirnov tests found no statistical difference between squadron positions, at the .1 level. On an aggregate basis, 57% said that this training was held once a month or less, and 82% indicated that technical training was held twice a month or less. When asked if they felt that the technical training program was effective, 78% of all respondents answered, "No." Of these, 100% of the commanding officers answered, "No," as did 80% of the junior enlistedmen.

Responses to open questions dealing with the likes and dislikes about technical training provide additional insight into this aspect of post entry-level training. Technical training was not considered as a productive work

center effort as it is currently defined in OPNAVINST 4790.2A. Those that had previously indicated regular technical training sessions were members of small shops, such as hydraulics, flight equipment, and ordnance. They were able to hold legitimate technical training lectures on short notice as the maintenance work load permitted. Common reasons given by each type of respondent are listed in order of frequency of response:

1. Classes are too repetitive and are boring to all except the most junior enlistedmen. Classes taught by technical representatives that are provided by contract with aircraft and aircraft systems manufacturers, NAESU engineers, and NAMTRADET instructors when locally available, were always enjoyed by members of the work center. While always appreciated, these sessions tended to be infrequent due to a work center's inability to plan and hold technical training as scheduled. The operation's schedule and resulting maintenance load to maintain an expected level of readiness generates an environment of interruptions and short notice demands that effectively negates any scheduled training effort. The remaining classes that were held were felt to be conducted only to satisfy a specification of OPNAVINST 4790.2A. Junior enlistedmen would be given short notice to scan an old, repeatedly used lesson guide, then would be permitted to read it to all available members of the work center, regardless of the experience of either the "instructor" or the audience. The lesson guides are seldom modified or redone. No one enjoyed creating lesson guides because of their low level of education, inability to write a developed thought, lack of experience, and work center indifference to the current technical training structure. The result, when technical training is conducted, is an exercise in tedium.

2. The technical training program is not flexible enough to permit training tailored for the experience mix of each work center. All members of the shop are required to suffer through training directed towards the less experienced. In shops without inexperienced people, technical training was not held. All supervisors felt that even though they had said that technical training was not held because of the work load, many admitted that there were periods throughout the work week when individuals did have time available for some practical learning experience.

3. There is too much emphasis placed on records. All squadrons interviewed had complete individual training records to "document their training for the next inspection." Supervisors admitted that their records were false; one particular supervisor showed individual training records that were completed through the end of the month. Estimates on the man-hours consumed by a work center's training documentation ranged from two to six hours per week, depending on the size of the work center. If squadrons have an average of seven productive work centers, the man-hours per month that are wasted on false documentation ranges from 56 to 168 man-hours per month. This range equates to 7 to 24 man-days lost, if an 8 hour work day can be considered as the average work day.

4. No facilities or training aids are available to maintenance departments to assist in any organizational maintenance training. When asked to rate the quality of training aids that were available to a work center supervisor for training, 77% of the total sample indicated that training aids were either nonexistent, or poor; only 20% felt that the available training aids were bearable and none felt that they were good , or

best possible (Table IX). All of the 20% that indicated that training aids were bearable were currently stationed at bases where their squadron had immediate access to the NAMTRADET for their respective aircraft.

TRNG AID * QUALITY *	*****	SQUADRON POSITION	*****	*TOTAL	% OF TOTAL*
	CO	AMO	SUPV	ENL	
Nonexistent:	3	3	9	10	25	28%
Poor :	6	5	14	18	43	48%
Bearable :	1	2	7	8	18	17%
Good :	0	0	0	3	3	7%
Best :	0	0	0	0	0	0%
Total:	10	10	30	29	89	

Table - IX FREQUENCY DISTRIBUTION OF QUALITY OF TRAINING AIDS AVAILABLE TO WORK CENTER SUPERVISORS

When asked to value technical training, two values were solicited. The initial value rated technical training as it was currently conducted; the second value expressed what they felt technical training could be if the problems accumulated above were corrected. A scale of five to one was used, with five representing the highest value (Table X). The aggregate valuation of the current program was 2.0, and the aggregate estimate for a potential technical training program was 4.4. There was no statistical difference between squadron positions at the .2 significance level. Current estimates by type of respondent ranged from 1.9 (Sgt to Pfc) to 2.2 (Commanding officers), while potential program estimates ranged from 4.0 (Sgt to Pfc) to 4.7 (Supervisors).

In both cases, Sergeant to Pfc estimates were the lowest of the type respondents. Of the total sample, 69% rated the current program ≤2, and 94% rated the potential program a value ≥4.

SQUADRON POSITION	*** TECH TRNG VALUE SCALE ***					*AVER*
	1	2	3	4	5	
COMMANDING OFFICER :						
CURRENT	1	6	3	0	0	2.2
POTENTIAL	0	1	0	5	4	4.2
MAINTENANCE OFFICER:						
CURRENT	4	2	4	0	0	2.0
POTENTIAL	0	0	0	5	5	4.5
SUPERVISOR :						
CURRENT	10	8	10	1	0	2.1
POTENTIAL	0	0	0	10	19	4.7
SGT TO PFC :						
CURRENT	13	16	9	0	0	1.9
POTENTIAL	0	0	4	20	14	4.0
AGGREGATE VALUE :						
CURRENT						2.0
POTENTIAL						4.4
AS % OF TOTAL :						
CURRENT	32%	37%	30%	1%	0%	
POTENTIAL	0%	1%	5%	46%	48%	

Table - X FREQUENCY DISTRIBUTION OF TECHNICAL TRAINING VALUE ESTIMATES

2. On-the-Job Training

"On-the-job training is the most widely used of all the means of training and is effective if properly guided." [MCO 1510.2H, p. 7, July 1974] It can be defined as the practical instruction of people in the performance of maintenance tasks, by demonstration and simulation, under the supervision of designated shop personnel [OPNAVINST 4790.2A, , Vol. II, p. 12-6].Experienced, well qualified men are utilized as instructors who can demonstrate and pass on their knowledge to the less informed. OPNAVINST 4790.2A indicates that the nature of this kind of training makes regular scheduling impractical, but that it can be effectively monitored by the use of a training syllabus. In the Marine Corps this syllabus would be prepared on the organizational level.

The survey clearly supports the popularity of OJT within aviation maintenance. In response to the training that was most beneficial to each respondent, 77% of all enlistedmen indicated that OJT had been the most beneficial to them. A breakdown of responses is shown in Table XI.

RESPONDENT	********* TYPE OF TRAINING ********				*TOTAL*
	TECHNICAL TRAINING	FORMAL SCHOOL	INDIV STUDY	CJT	
Supervisor:	1	1	2	26	30
Sgt to Pfc:	0	5	7	27	39
TOTAL:	1	6	9	53	69
% OF TOTAL:	1%	9%	13%	77%	

Table - XI RESPONSE DISTRIBUTION OF ENLISTED ESTIMATES OF TRAINING MOST BENEFICIAL TO THE RESPONDENT

Yet, when asked to indicate the means that they prefered to use to train subordinates, there was a significant difference between the Sergeant to Pfc response and the officer/work center supervisor response (Table XII).

RESPONDENT	********* TYPE OF TRAINING ********			*TOTAL*
	FORM SCH	SQD TRNG	INDIV STUDY	
Commanding Officer:	7	3	0	10
Maintenance Officer:	6	4	0	10
Supervisor:	19	8	3	30
Sgt to Pfc:	12	25	2	39
Total:	44	40	5	89

Table - XII RESPONSE DISTRIBUTION OF TRAINING MEANS PREFERENCE FOR SUBORDINATE TRAINING

While 65% of the officers and 63% of the work center supervisors felt that formal schools were preferrable to squadron training, 64% of the Sergeants to Pfc's felt that squadron training was more beneficial. Because of the consistent disreguard for technical training, squadron

training is equivalent to OJT. Young Marines felt a need to learn the aircraft, and felt that only through OJT and on-aircraft experience could they develop the necessary technical proficiency and knowledge. Formal schools offered a lot of theory and very little direct application. Officer and supervisor response recognized the intermittent nature of organizational training that results from external personnel obligations, like: mess duty, work details, guard duty, duty driver, TAD, and fleet augmentation of station activities such as swimming pool lifeguards. It was preferable to send the subordinate away to achieve a consistent, more productive training effort. The officer/supervisor approach is supported by the Center for Naval Analysis' Professional Paper Number 83, it concluded that while all Navy ratings could be learned through on-the-job training, A school graduates take less time to become proficient in their skill areas than nongraduates, and are more productive during the subsequent OJT periods.

To assess the degree that OJT is conducted with a specific syllabus, all respondents were asked to rate their OJT program's formality on a scale from one to five. A rating of five would indicate a well developed OJT syllabus that is applied to all incoming members of the work center. The average value of the sample's rating was 2.38, a rating which is representative of later comments that indicated that supervisors use OPNAV FORM 4790/33 to log the OJT performed. This form does not provide any identification or organization for the OJT required by the work center , or the individual for his own professional growth; as a blank page, the form serves only to accumulate sequencially the training received. While the Kolmogorov-Smirnov test could find no statistical difference between respondent types, it did identify a difference between the two Wings [Section IV, Table IV]. The cumulative frequency distribution shows a tendency for the 3rdMAW estimates of OJT formality to be

higher than those of the 2ndMAW. When average values are compared , the 3rdMAW average, 2.62, exceeds the 2ndMAW average, 2.13, by .49.

When asked what they liked about OJT, all enlistedmen responded that OJT was the only way to learn the aircraft. Demonstrated work that was shortly followed by supervised trainee application was by far the most popular of all methods. The officers felt that OJT provided the flexibility that technical training sessions lacked. When asked what they did not like about OJT, responses fell into four common categories; they are in the order of most frequent response:

1. OJT is completely dependent upon the instructor's attitude, experience, knowledge, and ability to communicate. Little stress is placed on published procedures, only those necessary to get the job done quickly. Downing discrepancies or those that are necessary prior to aircraft use for a specific mission tend to encourage rushed procedures and little to no explanation about the work demonstrated. The only qualification for an OJT instructor has been to have more experience than the trainee and the individual's availability. Only one squadron limited OJT to the work center supervisor, or one of three highly qualified Sergeants, who had previously been tested by the supervisor for ability to communicate the proper procedures.

2. OJT was an open, uncontrolled program that was solely dependent on supervisor integrity, initiative, and experience level. Only three work center supervisors could show a physical syllabus or programmed sequence of training that was necessary for that work center's MOS and output. While maintenance document boards were utilized in each shop to organize the work effort ,

only four work centers used the board to identify individual qualification levels. When asked how they account for individual qualifications, the general response was, "I keep it in my head,"or "I depend on my section leaders to know their people." Because of the lack of a defined, standardized syllabus for MOS and aircraft, OJT is completely dependent on current maintenance discrepancies that prompt supervisor assignments. To overcome this problem, 21 of the enlisted respondents (31%) felt that a standardized MOS syllabus for a specific aircraft would be helpful; a program similar to an aviator's NATOPS program was their analogy to prevent wasted demonstration of work, unqualified instruction, and assignment of work to the unqualified.

3. OJT is difficult to conduct when high operational loads and a shortage of experienced personnel limit the quality and rate of training conducted for Marines. Five Marines indicated that they were assigned to a night crew immediately upon their arrival at the squadron, where, because of little supervision, they would work off discrepancies without ever having had the work demonstrated to them. Generally, their only supervision was the CDI, or quality assurance inspector who is required prior to the work being signed off. Thus, they learned solely by trial and error. Since fiscal year 1975, the Navy's Aviation Safety Center has documented 79 mishaps that were coded as being caused by a lack of training, experience, or supervision. The data on aircraft accidents had not been coded and placed on their computer for ready retrival as of 17 August 1977.

4. Problems related to OJT programs for Staff NCO's that were granted lateral transfers to a different MOS, or for people that have been away from their speciality for a considerable period. Examples of Marines transferring from a ground MOS to an aviation MOS, like hydraulics, of metal-work, or mechanics that have spent the past six years on the drill field or as recruiter are not uncommon. Yet, there are no specific programs to provide the necessary training to update their proficiency. When the Marines, Sergeant to Pfc, were asked whether they felt that the Marine Corps would benefit from some form of MOS testing , 90% said,"Yes." The most frequent comment was similar to, "how can a guy be in charge of you when he doesn't know his job (MOS)?" Table XIII shows the sample frequency distribution for the question addressing MOS testing as a benefit to the Marine Corps. Three of the respondent groups had at least a 70% positive response to this question; 67% of the supervisors were in favor of speciality testing.

ANSWER	******** TYPE RESPONDENT ********				*TOT	% TOT*
	CO	AMO	SUPV	ENL		
Yes :	7	7	20	35	69	78%
No :	3	3	10	4	20	22%
Total:	10	10	30	39	89	
% Yes :	70%	70%	67%	90%		

Table - XIII DISTRIBUTION OF OPINION CONCERNING MOS TESTING AS A BENEFIT TO THE MARINE CORPS

V. ALTERNATIVES

During the course of a literature search for current approaches to individual training, the training programs of three major services were reviewed as well as periodicals, texts, and professional/academic papers. Studies such as, "On-the-Job Training in the Air Force," by the Air Force Human Resources Laboratory were to be a means of identifying problems that were common to all services, and then used to aid the question formulation for this survey. Yet, the real benefit came from the identification of unique approaches to individual training that had resulted from a major reevaluation and subsequent revision within the recent past. The concepts that were common to open responses generated on the initial pilot survey were subsequently used as the alternative choices for question number 45 of the survey's questionnaire (Appendix A). To provide a better understanding of these alternatives, the individual training programs of the United States Air Force, Army, and Navy are discussed.

A. CURRENT SERVICE PROGRAMS

1. United States Air Force

a. General

The Air Force OJT program is an integrated training program that qualifies airmen, through self-study and supervised instruction, in the knowledge and job proficiency needed to perform their duties within an Air Force speciality (AFS). The Air Force is unique among all the services in having a very detailed OJT manual (AFM 50-23), which serves as the basic reference for their training program. It will serve as the basis for most of this discussion.

b. Background

Prior to 1961 supervisors discovered that because of increasing job specialization, they did not have the time or equipment to train a young airman in all the tasks of his speciality without making serious sacrifices in the quality of training, or unit productivity. There were many complaints from supervisors who were forced to train people in skills that were not needed in the current jobs, at the expense of accomplishing other high-priority work. Training records began to be falsely documented to enable airmen to advance and to protect the supervisors during inspections. A major, three-year, review created the dual-channel OJT system that the Air Force uses today [Air

Force Human Resources Report Number 75-83, pages 23-26]. The requirement for a general knowledge of all subject matter areas within a speciality was continued, but rather than requiring proficiency in all tasks of a speciality, only those currently assigned would be considered for skill upgrading. Each speciality is organized into skill levels that are analogous to ability levels. Upon assignment to his first operational unit, the airman is enrolled in an OJT program for the semi-skilled level, level 3, of his speciality. The first two skill levels are completed in recruit training. The requisite OJT program, or a combination of OJT and formal schooling must be completed for each successive skill level to reach skill level 7, the advanced level. Upgrading requires more than completion of the OJT course, it requires:

1. A minimum amount of time must have elapsed;
2. Successful completion of the Career Development Course final exam;
3. Supervisor certification of the required task-level proficiency training.

Supervisors are required to take the necessary action: counselling, remedial assistance, or warnings, well prior to the maximum time limits for advancement to the next higher skill level. Those airmen who have not demonstrated an ability to progress are subsequently evaluated by an administrative board for speciality retention or transfer to a less technical speciality.

The second, distinct, aspect of career advancement is promotion to a higher rank. Promotion eligibility is determined by skill level achieved, and by a composite score of weighted factors that generates an eligibility zone for promotion. All airmen eligible for promotion to paygrade E-5 through E-7 are given a Speciality

Knowledge Test (SKT) annually. The SKT deals with specific job knowledge of a speciality.
A separate promotion fitness examination is used to measure knowledge of general military subjects and management practices for a specific grade.

c. Dual-Channel OJT

Dual-channel OJT involves career knowledge training and job proficiency training. Both are based on Speciality Training Standards (STS) that list the tasks, knowledges, and study references necessary for airmen to perform duties within their speciality [Air Force Reg 8-13]. These standards are detailed breakdowns of the more general speciality descriptions that are found in Air Force Manual 39-1, which is analogous to the Marine Corps' MOS Manual. Each STS indicates the minimum proficiency recommended for each task and knowledge level for qualification at a particular skill level, provides the basis for supervisor-planned OJT programs, and defines the knowledge requirements that are covered by the speciality knowledge tests (SKT).

Career knowledge training is provided by a Career Development Course (CDC), that is written by a cognizant technical school and published by the Extension Course Institute, which is analogous to the Marine Corps Institute. These courses contain information on career field fundamentals, basic principles, and common knowledge requirements of a speciality. It not only is a major ingredient for skill upgrading, but also includes review material and references that cover the next speciality knowledge test. The CDC includes:

1. Chapter Review Exercises - open book exercises that are

placed at the end of each chapter.

2. Volume Review Exercises - open book, multiple choice exercises that cover an entire volume. They must be completed by the trainee and submitted to the Extension Course Institute for grading and critique.

3. Course examinations are closed book, and have multiple choice questions that span the entire course. Each examination is supervised and the grading done by the Extension Course Institute.

4. Study Reference Guide - a topical outline of each course volume, which is always referenced by the Extension Course Institute for questions that are missed on the Volume Review Exercises.

Job proficiency training is basically a supervisory responsibility. Since the STS lists all the tasks that are expected of an airman in his speciality, the process of modifying the standard to a particular job can be as simple as circling specific tasks and standards, or the STS can be used as the basic reference for a locally prepared job proficiency guide. The airman is involved only with the OJT that is directly specified by his guide; he knows the level of performance necessary for skill upgrading and advancement.

2. United States Army

a. General

The Army has three classes of individual OJT. They are:

1. MOS-producing training qualifies people in an MOS when

no formal course exists, or when attendance is not feasible;

2. Augmentation provides additional training not obtained during MCS qualification to qualify an individual in aspects of a job that are not included in the MOS-producing process;

3. Cross-training is used to partially qualify people of an MCS in skills of another MOS, or trains them for different tasks within a given MOS structure.

b. Background

In 1971, the Board for Dynamic Training completed a needs assessment of Army training; it identified discrepancies between what the Army required and what the Army was actually doing. The solution strategies recommended were so extensive that a new agency, the United States Army Combat Arms Training Board, was formed to manage their implementation. Some of the developments that are currently being used are:

1. Technical Extension Courses (TEC),

2. An integrated personnel management and training system,

3. Technical publication modifications that made reference manuals into training resources,

4. Training and Doctrine Command Training Management Institute that will provide expert instructional technology consulation and services to Army schools.

Both the technical extension courses and the integrated personnel management and training system are discussed further.

c. Technical Extension Course

The technical extension course is pre-packaged, self-instructional training for tasks requiring additional training within the job environment (such as: initial, refresher, and continuation training). Whenever possible, audio-visual means are used to reduce the effects of low verbal ability on task accomplishment. The initial courses were slides and tapes; when storage began to be perceived as a problem, courses were developed as Super-8mm movies with audio tracks. Occasionally, tape cassettes, printed texts, and other job aids, like trouble-shooting flow charts have been used when appropriate. All tests have shown that while storage is a problem, it can be solved through the use of a centralized library. The question of unit deployments was not addressed, but does present a problem if centralized libraries are effected. The validated TEC's have not only reduced the bias induced by low verbal English ability, but have increased all performance test scores, regardless of mental ability, over those tested without the benefit of the TEC support. A more detailed understanding of the TEC development can be found in the April, 1976 paper for the American Educational Research Association, "TEC, a Manhattan Project in Educational Technology," by W.K. Roberts.

d. Enlisted Personnel Management System

The Enlisted Personnel Management System (EPMS) was developed to mold the existing programs of training, evaluation, classification, and promotion into an integrated system. In addition, before a soldier is considered eligible for promotion, he would be required to demonstrate a specified level of skill proficiency. A series of

career/management courses are taught at local NCO academies to aid competent enlistedmen in assuming more demanding positions. There is a corresponding career course for every skill level. This relationship is seen in Figure 7. Completion of the appropriate career course will waive the minimum time requirements for skill level upgrading.

The soul of the Army's OJT program is the Soldier's Manual. It contains what the Army expects each soldier to know and do for his MOS and skill level. Skill level 1 - 2 manuals also discuss the MOS, its skill level, skill level testing, TEC availability, promotions, EPMS, and how to best use the various sections of each volume. The bulk of the manual is a collection of common tasks. Each task is explained in terms of:

1. The conditions under which the task was completed,
2. The standards of performance required,
3. The performance measures that outline suggested steps in performing the specific task.

These are followed by the applicable study references, which include TEC's and field manuals.

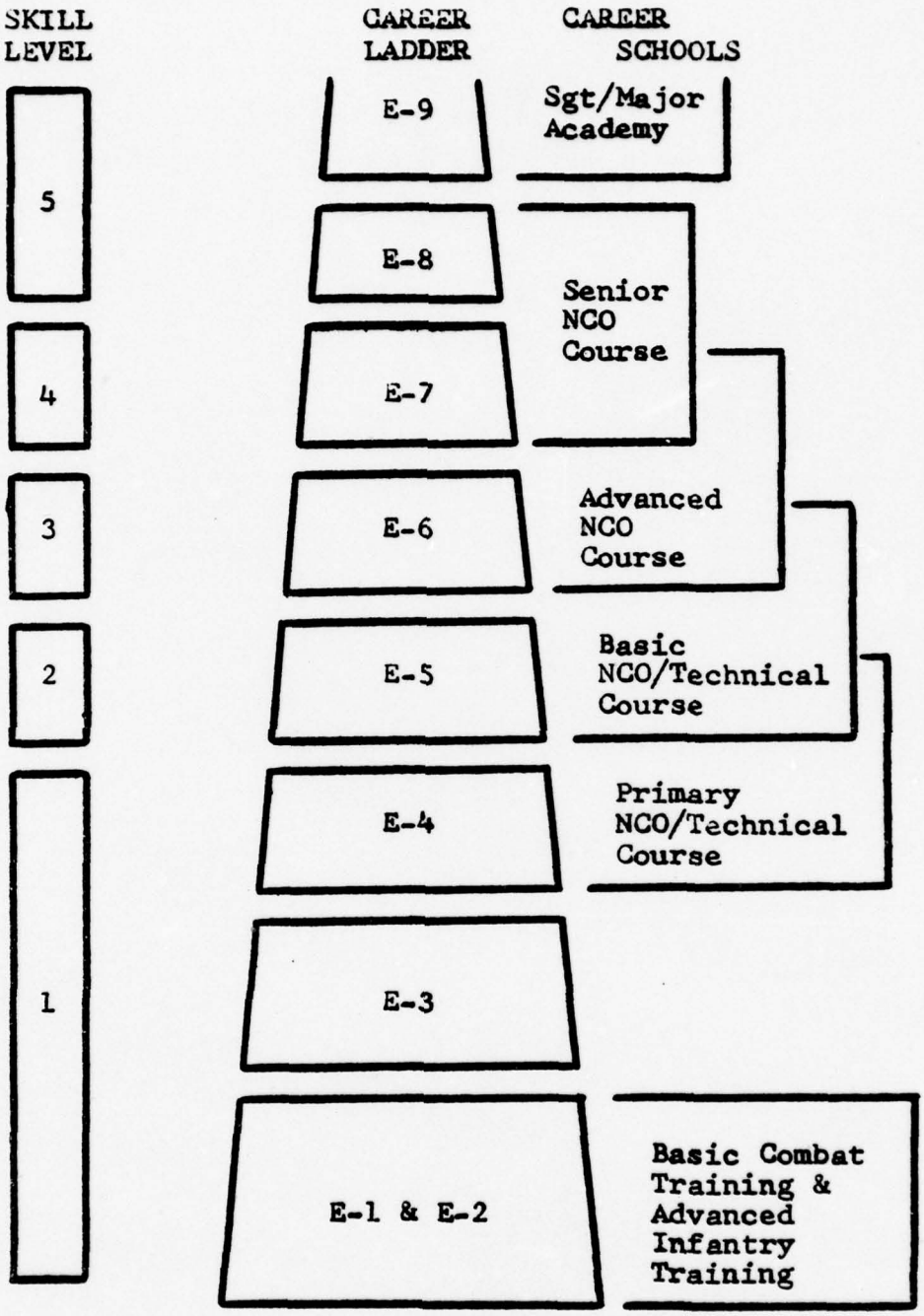

Figure 7 - THE RELATIONSHIP OF ENLISTED CAREER STRUCTURE TO ARMY CAREER COURSES

The skill qualification test (SQT) is designed to measure abilities to perform critical tasks at the current and subsequent skill level. It has three components: performance certification, hands-on demonstration, and written examination. The performance certification component is designed to allow the unit commander to certify that the individual is capable of performing selected critical tasks which cannot be appropriately tested by the hands-on, or written components. It consists of one to ten scoreable tasks from the Soldier's Manual that must be observed by a supervisor over a period of time, or because of the complexity of the task would be unacceptable to the hands-on portion. Generally, a soldier would be notified that he would be observed while completing a particular task, the supervisor subsequently observes and answers a series of questions about the soldier's performance, and determines whether the performance was acceptable. The written component consists of 30 to 50 questions that are taken directly from the Soldier's Manual. The questions are oriented towards making the soldier work through some problem, using the same skills that he would use if required to do the task when normally working. The hands-on component appropriately tests only the applicable physical skills. It will be developed to equate the doers and the test takers. An example of a hands-on component would be the emplacing, arming, and firing of a claymore anti-personnel mine. Each task is conducted under the same conditions specified by the Soldier's Manual. The SQT is administered within 18 months of a soldier's MOS assignment, and is mandatory every other year thereafter. Soldiers desiring to improve their scores, or those who have previously failed, may or have to take the examination annually.

3. United States Navy

a. General

The Navy's enlisted advancement system is based upon the provision of adequate enlisted training. In-service training, OJT, and self-study provide the balance of training not provided by the formal technical schools. The emphasis on self-study is significant. Many Navy training courses are mandatory, which results in as much as 90% of the Navy's enlistedmen being actively involved in some type of correspondence course [Air Force Human Resources Laboratory Report 75-83, p. 21].

b. Background

The Navy's basic advancement and training relationship has been satisfactorily integrated for some time [BUPERSINST 1430.16]. A major change has been implemented to standardize training in certain functional areas, which have amended the use of practical factor requirements that are used in determining eligibility for advancement. Eventually, this standardization will serve the same purpose as the Army's Soldier's Manual, and the Air Force's Speciality Training Standards. Each identifies, in its own way, the training that is required in a service-wide manner.

c. Naval Advancement System

The specific qualifications for advancement in rate is detailed under practical factors and knowledge factors in the Manual of Qualifications for Advancement (NAVPERSINST 18068). When used in conjunction with the Bibliography for Advancement Study (NAVTRAINST 10052), which lists the mandatory training courses, a complete picture of advancement requirements can be found by any sailor for his rank and skill. A Navy-wide advancement examination is given bi-annually for pay grades E-4 to E-6, and annually thereafter. To qualify for eligibility to take the advancement examination, each sailor must:

1. Satisfactorily complete the appropriate correspondence course for his/her rating;

2. Satisfactorily complete the "Military Technical Correspondence Course," or A school for consideration for promotion to E-4;

3. Satisfactorily complete the appropriate "Military Leadership Exam" for Petty Officer's 3rd and 2nd Class;

4. Complete the practical factors specified for his rating and rank, and pass the performance tests when required since not all ratings/ranks require them;

5. Be recommended by his commanding officer.

The advancement examination is not limited to the material covered by the mandatory correspondence courses. References for the scope of each examination are provided by the Manual of Qualifications for Advancement by topic, rank, and rating. Each examination is validated prior to publication to maintain technical currency within a six month tolerance. If the examination is passed, the resultant score becomes a

weighted factor in a final "multiple"; a composite score is used to rank all qualifying enlistedmen by rate . Promotions are awarded to those whose final multiple is above a cut-off score that is determined by appropriate staff function of the Chief of Naval Operations.

d. Personnel Qualification Standard

The personnel qualification system was initially implemented in aviation specialities and is being applied to other specialities within the Navy as the material is developed at the Personnel Qualification Standard (PQS) Development Center in San Diego, California. It is used in addition to the mandatory correspondence courses for career and rate knowledge, since it deals with the theory, knowledge, and skills required to operate a specific piece of equipment or system. Each PQS is developed for a specific aircraft or ship, and is unique in this regard (NAVTRAINST 43100-1A). Tests and observations are used to evaluate whether Personnel Advancement Requirements (PAR) have been completed. These are specified in a PQS program and will eventually replace the analogous practical factor requirements.

Each PQS system is a collection of billet specific booklets and qualification cards for a particular aircraft model. Each speciality would have a booklet that serves as a detailed qualification guide. Conceptually, it is the guidance that an experienced, highly qualified supervisor would give a trainee if he had unlimited time to personally outline every facet of a particular job for the trainee. In a standardized sequence, questions are asked which progressively develop knowledge, understanding, and ability. Each PQS program is divided into standardized sections that develops the topic logically.

1. A preface is used only when revisions have been made to a previous edition and require identification.

2. An introduction explains the PQS program, its use, and the booklet's formate.

3. A glossary of terms clarifies any questionnable technical term.

4. The theory section covers the appropriate basic knowledge, and includes a development of safety precaution's theory.

5. The systems section breaks the specific aircraft into its systems and component parts, then identifies those that are relevant to a particular speciality. Each system provides references for that system, requires an ability to sketch the system, prepares relationships between components, and asks how they operate together. Operating limits, and relationships to other systems are also covered.

6. A Watch Stations section identifies the specific tasks that are required to perform a particular function. There are two types of Watch Station, operator and maintenance technician; each is organized accordingly.

A qualification card is provided each trainee and it is generally maintained in the work center. It is used to track the completion of PQS items as performance is demonstrated and signed off. When an individual is transferred, he has a current assessment of the extent of his training, as does the new supervisor to whom he was transferred. Upon arrival in his new work center, the degree of his proficiency can be verified by asking questions or supervising work that is appropriate to his level of training. Those who have had significant absences from their speciality or aircraft are provided a standardized, Navy-wide means of structured training.

It is interesting tc note that PQS has already been developed for the following: A-6/A/B/C/E, F-4, F-14, CH-46, and CH-53 (CNETNOTE 3500).

B. DISCUSSION OF ALTERNATIVES

While there are specific, detailed differences between the actual implementation of the individual training programs of the majcr services, each appears to have independently developed elements that are similar in purpcse to elements of the cther services' training programs. Each service has recently undergone a major review and subsequent revision of its individual training program that has resulted in these similarities. Subsequent to the Board of Dynamic Training, the Army has jcined the cther two services in the development of a fully integrated individual training program that ties measureable individual proficiency and general specialty knowledge to enlisted advancement. Additionally, it provides organizational ccmmanders with service-wide task, kncwledge, and performance standards for each specialty, and the means to educate their subordinates in these standards. Thus, each service has develcped a specialty qualificatien program that focuses on career growth, and is based on advancement motivated self-study, and supervised OJT. There are four basic similarities.

1. A structured means of providing each enlistedman with the tasks, knowledge, and performance standards that are expected service-wide fcr each rank and specialty.

2. Heavy dependence cn technically specific correspondence courses that provide job-knowledge training, and are integrated with kncwledge testing, specialty standards, supervised OJT, proficiency testing, and advancement.

3. Aids tc standardized supervisor-planned CJT.

4. Examinations that measure general, specialty, and specific job knowledge, leadership/managerial skills, and job proficiency in a variety of ways to gain a more complete picture cf an individual's ability which is otherwise biased when evaluations are solely written examinations.

These prcgrams are similar to the general training model in that they have the ability tc cope with necessary change and provide commanders on all levels with training perfcrmance feedback. They also provide the individual enlistedman with performance feedback, so that he knows exactly where he stands relative to his contempories and the expectations of his service. This is a means that is much more objective than the Marine Corps' subjective assignment cf a proficiency mark, somewhere between one and five, by an enlistedman's supervisor on a bi-annual basis.

An additional alternative was identified during the validatien of the survey's questionnaire. One Marine aviator with previous maintenance experience and one cf the Staff NCO's that had been interviewed on the telephone independently suggested that standardized technical training lesson guides, that were prepared external tc the squadron for aircraft and specialty, be considered as an improvement to the existing system. Reference was made to the detailed systems and trouble-shooting lesson guides that were used by the Bell Helicopter technical representatives on contract to the Marine Corps for their technical training lectures on the AH-1J helicopter. It was indicated that they were far superior tc any work center effort, generally including color transparancies of systems, trouble-shooting flow charts, and detailed system explanations. A questicn was posed about the possibility of having the ccntractor provide these lesson guides as he does NATOPS Manuals and other

technical publications. Subsequently, any aircraft modification/revision would be reflected in a revised lesson guide when appropriate. A small nucleous of standardized, well prepared, technically proficient guides would be maintained by each maintenance department for work center technical training. This idea was later included as an alternative to the current approach to technical training lesson guides, in question number 45 of the questionnaire.

The final question of the survey asked each respondent to choose from a list of potential alternatives those that each would like to see used to improve the quality of individual maintenance training. Due to the initial positive response for the alternatives during the pilot testing, each respondent in the sample was asked to rank the alternatives in order of preference subsequent to an explanation of each alternative by the interviewer. Examples of the personnel qualification standard (PQS) and the Soldier's Manual were shown to each respondent prior to their selections. Once the Soldier's Manual was compared to the PQS booklet, 84% of the respondents felt that they were too similar, but indicated that they preferred the already developed, aircraft specific PQS system. The Soldier's Manual was dropped for the computation of the Kendall coefficient of concordance because of respondent preference for the PQS system. Due to the voluminosity of the response to this question and the value of the rank sums in ordering ranked items, Table XIV provides the rank sums and the implied relative rank by respondent and alternative.

RESPONDENT ******* INDIVIDUAL TRAINING ALTERNATIVES ******					
	STANDARD LESSON GUIDES	TAPES AND FILMS	PERSONNEL QUAL STANDARD	TECHNICAL EXTEN CRS	PROGRAM TEXTS
Commanding Officer:					
Rank Sum	17.0	28.5	24.0	38.5	42.0
Rel Rank	1	3	2	4	5
Maintenance Officer:					
Rank Sum	19.5	30.0	18.5	36.5	45.5
Rel Rank	2	3	1	4	5
Supervisor :					
Rank Sum	46.5	97.0	65.5	99.0	138.0
Rel Rank	1	3	2	4	5
Sgt to Pfc :					
Rank Sum	94.5	115.0	66.5	123.5	181.5
Rel Rank	2	3	1	4	5
Aggregate :					
Rank Sum	177.5	270.5	174.5	305.5	407.0
Rel Rank	2	3	1	4	5

Table - XIV RESPONDENT RANKING OF ALTERNATIVE TRAINING MEANS THAT IS BASED ON ALTERNATIVE RANK SUMS

Due to the sample size differences for each type of respondent, the rank sums vary in magnitude between type of respondent, but still show relative order within the type of respondent. The only variation in alternative order between type of respondents was between first and second choice. Commanding officers and supervisors selected standardized lesson guides over the personnel qualification system, and followed with tapes and films, technical extension courses, and programmed texts. Maintenance officers and enlistedmen, sergeant and below, chose the personnel qualification program over standardized lesson guides, and followed with

tapes and films, extension courses, and programmed texts. When the choices were ranked by the aggregate rank sums for each choice, the PQS system was slightly ahead of standardized lesson guides; both demonstrated very strong preferences. This is consistent with responses to the open questions that deal with problems with OJT, technical training, and MOS qualification. When the coefficients of concordance for each group were compared, the supervisors had the strongest agreement, W=.641, and commanding officers had the lowest agreement, W=.424. The aggregate coefficient of concordance was W=.48 which was significant at the .01 level. If a coefficient of concordance was computed from the relative rankings provided by each type of respondent, the coefficeint jumps to W=.95, at a significance level of .01. This indicates that while there is general agreement between the respondents as individuals, there is a much stronger agreement between types of respondents, who tended to rank the choices similarly.

VI. CONCLUSIONS

The Marine Corps has perpetually fostered an image that is characterized by its readiness to respond on short notice to any assignment. The ultimate test of this readiness is the Marine Corps' ability to accomplish this assignment in combat. To be prepared to meet this challenge, the Marine Corps must maintain a training program to provide the requisite skills, techniques, and experience levels for a variety of specialties. Because of this emphasis, much attention is directed towards tactical operations and the requisite unit training, and little attention is directed towards technical knowledge and individual specialty training. This impression is confirmed by a systems analysis of CJT programs that was conducted in 1975 by Stephenson and Burkett of the Air Force Human Resources Laboratory and a recent article in the September, 1977 issue of the Marine Corps Gazette, entitled, "A Need to Evaluate Combat Readiness," by R.L. Carter. The development and eventual implementation of the Marine Corps Combat Readiness Evaluation System (MCCRES) to measure battalion, squadron, and battalion landing team (BLT) performance levels supports the emphasis placed on unit training and readiness. Until the Board for Dynamic Training, the Army also focused on unit training, but it has subsequentally developed an intensive individual training program that not only supports the needs of organizational commanders by providing needed occupational training, but has developed the best, most complete means of evaluating individual performance, and integrating it with personal advancement. The support for a similar evaluation program in the Marine Corps was demonstrated when 90% of the Sergeants and below, and 78% of

all respondents indicated that MOS/Proficiency testing would be benefical to the Marine Corps.

Efforts like: MCCRES, tactical exercises, readiness reporting, and maintenance documentation all focus on providing feedback about unit readiness. The pressures on unit performance measures have created doubt in some circles about the validity of current unit readiness reporting and maintenance documentation that provides the data for aircraft readiness reporting. The acknowledgement by work center supervisors of falsely documented individual training records bears a strong similarity to the action of Air Force supervisors prior to the development of the Dual-channel OJT program, and is a prime example of the misrepresentation that in fact extends deeper than individual training records. Just as evaluation is so important to the unit training models, it is just as important to the individual training model. A much finer picture of a unit can be developed from an individual evaluation of knowledge and job proficiency by sources external to the squadron, which when combined with measures of unit performance gives an accurate representation of the unit's strengths and weaknesses. Experience has shown that during squadron deployments, participation in tactical exercises, and other operational commitments, squadrons tend to rely on a select few who ultimately are overtaxed; their efforts are not representative of the unit's long term capabilities, but an ability to be a short term statistical success. Other than an emphasis on general military skills, such as: rifle qualification, physical fitness tests, and general military subjects (interior guard, military law, individual tactical measures, and first aid/field sanitation, etc.) no attention is directed towards the most consuming, most relevant portion of an enlistedman's career in an aviation specialty - technical proficiency. The Marine Corps' individual training model pays little or no attention to

individual aviation maintenance training, specialty knowledge, or demonstrated proficiency. It has not integrated personal advancement with measureable job proficiency, but has relied upon a supervisor's subjective, bi-annual, evaluation, where six months of "impression" are compressed into a single proficiency mark, from one to five.

The Marine Corps still operates as an early twentieth century owner-manager, relying on self-motivation and unstructured learning of technical skills beyond that provided by A and B school. The training guidance and performance objectives are well defined by MCC 1510.2H, yet, when each element of the Marine Corps' individual training model of an aviation maintenance environment is inspected, it becomes apparent that the current model leaves much to be desired. Commanders are told that they will train their subordinates in mission essential skills, but are given no assistance in this local education process. They and their supervisors feel constrained by time and resources to "get their aircraft up," and tend to shun formal technical training and apply OJT in a haphazard manner, as maintenance discrepancies present themselves. Those sampled did consider training a factor of aircraft readiness, but would push it aside for immediate attempts at making aircraft flyable. If commanders were held accountable for the responsibility of individual training for their enlistedmen and given the means with which to conduct legitimate training, much of the discontent and waste that was identified by this survey would be corrected. The backbone of each service effort to provide some form of planned, coordinated, and continuous training was a personnel qualification program. Job standards, task specifications, specialty knowledge, and expected levels of performance were detailed in a service-wide publication and distributed to every enlistedman. As the basis for individual training, it can be easily augmented with technical extension courses

that are either required or voluntary, supervisor-planned OJT, or classroom instruction. It currently takes three months to one year after an MOS is assigned for a Marine to be considered qualified to work on an aircraft unsupervised, on tasks that are commensurate with his rank and specialty. Can this second apprenticeship of a "qualified" Marine be shortened by a more standardized, clearly defined personnel qualification program? Of all the alternatives presented to the respondents, the concept of a structured specialty advancement system was the most popular.

Marines enjoy OJT because it provides them the only real training that they will receive on their aircraft, even if it is unstructured, unorganized, unstandardized and random. The technical training program is sorely abused, currently ineffective, and wasteful of maintenance resources. Technical training is not held regularly; much of the training that is held is boring and demotivating; and the false documentation of individual training records consumes a needless amount of man-hours. A more flexible program is required. One that provides a quality presentation to those that need it, and one that can meet the needs of a range of experience levels within a work center. So much emphasis is placed on the immediate, that supervisors soon lose sight of the future costs of any form of technical training foregone. Detailed lesson guides that are standardized by MOS and aircraft can be professionally prepared external to the squadron. This will improve the quality of those lectures that are necessary. The planned use of qualified, highly knowledgeable instructors offers a fine source of information, if training can be scheduled and held. Those whose level of experience and knowledge exceeds the capabilities of technical training lectures could be provided the time to work on career, or specialty enhancing extension courses that will prepare them for advancement. If technical training in the broadest sense was made more

effective, and tied in with personal advancement through some combination of knowledge and proficiency testing, there would be no need for the current fixed requirement of two hours of technical training a week. If nothing else, the absence of the fixed requirement would free the man-hours currently devoted to false documentation of individual training records.

The Marine Corps holds a very weak second place to the other services with its current approach to individual aviation maintenance training. This survey was constrained by time to a sample of 89 respondents from ten randomly selected squadrons from either the 2nd or the 3rd Marine Aircraft Wing, the investigator would have liked to have provided more detailed information about other service approaches to individual training to more responderts to better understand Marine aviation-wide feelings about existing alternatives to the current environment that they are expected to operate within.

Because of the existing state of TME management of unqualified Marines, technical training abuses, an unstructured and unstandardized OJT program, and recent developments in individual training programs of the other services, it is recommended that a serious review of individual training be conducted by the Marine Corps, and that modifications to positive programs of the other services be considered as possible improvements to the current Marine Corps individual training program.

APPENDIX A

SURVEY QUESTIONNAIRE

2ndMAW 3rdMAW HELO FIXED WING

Source:

CO AMC W/C Supv Sgt Cpl L/Cpl Pfc

1. How long have you been in this squadron?
2. Have you always worked with this a/c?
   How recent was the change?
3. List the factors (from the most significant to the least) that most influences your a/c availability.
4. Would you estimate the operational load of your squadron as being:
   a. Heavy - above utilization
   b. Medium - about utilization
   c. Light - below utilization
5. Your average monthly flight hours for the past six months were: HOURS.
6. Your average monthly availability for the past six months was: %.
7. (O and S) How do you measure the quality of the Maintenance Dept/work center's productivity?
8. (O and S) Do you have any problems with the assignment of non-T/O maintenance MOS's to your work centers (People with no background in your a/c)?

9. Would ycu say that:
   a. Maintenance dominates Operations,
   b. Operations dominates Maintenance,
   c. There is a balance between the two.

10. (O and S) How often does your Maintenance Dept/work center really perform technical training?
   a. Less than monthly to once a month
   b. Twice monthly
   c. Three times monthly
   d. Weekly or more often

11. (Enl) Hcw often do you really attend technical training?
   a. Less than monthly to once a month
   b. Twice monthly
   c. Three times monthly
   d. Weekly or more often

12. Is the current technical training program effective?

13. (S and E) Does the technical training prcgram in this squadron help ycu or yotr subordinates do their wcrk any better?

14. What dc you like about the current technical training program?

15. What don't you like about the current technical training program?

16. Rate on a scale of 5 to 1 (5 being the highest) the value of the technical training prcgram in this squadron to you.

17. Estimate, on a percentage scale, the productivity of the personnel that are assigned to ycur squadron/work center upon completion of their category A training under a TMU/TME %.

18. (S and E) If you qualified under a TMU/TME, how much of the practical training did you really complete? %. How much of it was just signed off %.

19. (S and E) Does the TMU/TME really qualify you for your MOS?

20. (S and E) From the time that a person is assigned to your work center from a TME, how long does it take him to be able to handle the tasks specified for his MOS and rank, without requiring direct supervision by another?

21. (S and E) About how long does it take a Marine to qualify as a CDI, once an MOS has been assigned?

22. (S and E) If you can, rate the quality of the TMU/TME program in its support of your MOS, on a scale from 5 to 1.

23. (S) Are you given what you feel is needed to properly manage the individual productivity of your people?

24. (Enl) Is your supervisor able to follow your performance, and easily identify your ability to do a task without supervision?

25. (S) How much time can you afford to spend on training management?
Is it enough?

26. (S) Do you have enough time to evaluate whether an individual is proficient and able to do a task properly?

27. (Enl) How much time, per month, does your supervisor spend on training management (assigning topics, reviewing outlines, scheduling other speakers, and record keeping)?

28. (Enl) Does he have enough time to evaluate whether you are able to do a task by yourself?

29. Estimate, on a scale of 5 to 1, the formality of your squadron's OJT program (5 again represents the most formal).

    (formality: TIMI defined program, qualification checklist, the degree of detail, as compared to word of mouth/in the head organization)

30. Rate on a scale of 5 to 1 the quality of your Maintenance Dept/W/C management of individual development (5 represents the best possible).

31. What do you like about the OJT program?

32. (S and E) What is your major complaint about the OJT that you or your subordinates have received during a Marine Corps' career?

33. Could the OJT currently received in this squadron be improved?

34. How do individuals know what they have to do in order to be qualified for their job and to prepare for jobs of more responsibility?

35. How do individuals know what they have to achieve or accomplish before they are recommended for promotion?

36. (S and E) Which of the following has best helped you, or would help you to qualify as a collateral duty inspector (CDI):
    a. Supervised OJT
    b. Technical training lectures
    c. Individual study

37. (S and E) Are you satisfied with the quality of training that you have received during your career?

38. Are the MIMS and other maintenance publications hard to understand and apply?

39. Do you think that MOS testing to qualify a Marine for advancement would be beneficial to the Marine Corps?

40. (S and E) Have you attended a formal school for your MOS?
Did the school help you in your work?

41. Which would you prefere to use tc increase the individual productivity of your subordinates?
a. Fcrmal schooling
b. Squadron training
c. Individual training (extension courses)

42. (S and E) What training has been most beneficial to you?
a. Fcrmal schcol
b. CJT
c. Technical training
d. Individual study

43. (O and S) How could the Marine Corps improve your ability as a manager of people to increase squadron technical proficiency?

44. Would you say that the quality cf training aids available to your squadron for maintenance training of any kind was:
a. Non-existent
b. Pcor
c. Bearable
d. Gcod
e. Best possible

45. Of the following, which would you like to use to improve the quality of your maintenance training: (Rate all choices in the order of your preference)

a. Standardized lesson guides, prepared external to the squadron
b. Tapes and films on specific technical subjects
c. A detailed MOS qualification program, similar to the Navy's PQS
d. A task description manual, similar to the Army's Soldier's Manual
e. Technical extension courses
f. Programmed texts on aircraft specific areas
g. Other, please specify

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OFFICERS:
a. Prior enlisted service:
b. Total service:
c. Approximate time in maintenance billets:
e. Ever been: Ops O, or AMC?

SUPERVISORS:
a. MOS:
b. Has all service been in this MOS?

ENLISTEDMEN, Sgt to Pfc:
a. MOS:
b. Total service:
c. Number of meritorious promotions received:

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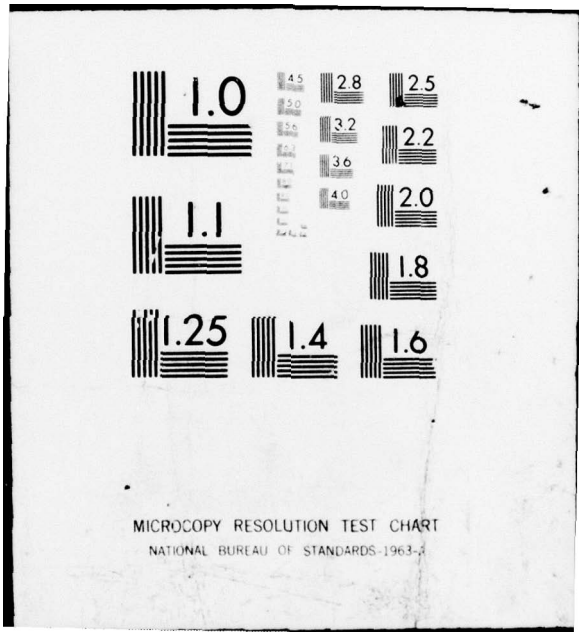
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