HUMAN ENGINEERING CONTRIBUTIONS

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Prepared for
THE WORKING GROUP ON HUMAN BEHAVIOR
UNDER CONDITIONS OF MILITARY SERVICE

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DESIGN OF HANDGRIPS FOR G. E. PEDESTAL GUN SIGHT

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1. Statement of topic: Lack of application of research findings on optimal design of handgrips for G.E. Pedestal Gun Sight and later versions of this sight.

2. Applicable data: Experimental studies have been conducted by Beier, D. C. and Prentice, W. C. H., (1) and by Johnson, A. P. and Milton, J. L., (2) on the relative accuracies of tracking with the standard tracking, ranging and triggering controls on the G.E. Pedestal Sight, a squeeze grip (pistol grip) type of control, and a knob-like tracking and ranging control for the right hand. These studies all agree in showing the squeeze grip (or pistol grip) type of control superior in accuracy of use for tracking, ranging and triggering than the standard tracking, ranging and triggering controls on the G.E. Pedestal Sight.

3. Appraisal and summary of data: These data indicate that by use of the squeeze grip type of control on this sighting system, gunnery accuracy probably could be improved considerably.

4. Service policies and practices: The above data were reported in 1945 and 1946 and yet the earlier and inferior type of hand controls are installed in at least one of the most recent types of heavy bomber, namely the B-36. This means that the gunnery defense of the B-36 is probably not as accurate as it could be if the suggested modification of operator controls were adopted.

5. Recommended action:

a. Inclusion of informed personnel (as members or consultants) on development panels or committees to insure application of human engineering research results to design and development problems.

b. Consideration of a revision of any current specifications which call for use of G.E. Pedestal Sight so as to include modification of operator controls

References:

a. Beier, D. C. and Prentice, W.C.H. OSRD Report No. 5558, 10 Sep 1945.

b. Johnson, A. P. and Milton, J. L. AAF Aviation Psychology Program Research Reports, Report No. 19, Fitts, Paul M. (ed), 1947.

DESIGN OF TRAINING DEVICES

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1. Statement of topic: Design of training devices so as to provide the trainee with adequate knowledge of results.

2. Review of applicable data: A great deal of research has been performed, both in the laboratory and in the field which indicates that learning is more efficient when the learner is given information regarding the correctness or incorrectness of his behavior. In many cases little or no improvement results from practice on a task when no knowledge of results is provided whereas learning is quite rapid when information regarding performance is given.

3. Appraisal and summary of research data and principles. A detailed summary of the research on knowledge of results as a factor in learning would be too voluminous to present here. In general the research indicates that learning with knowledge of results is faster than without knowledge of results and that learning is faster when knowledge of results is presented immediately. Since this research has been performed under a variety of conditions, with a variety of tasks, and using several methods of assessing learning, it is felt that the results have wide generality.

4. Service policies and practices: It is felt that, whenever possible, training devices should be designed so as to provide the learner with adequate knowledge of results. There are numerous instances in the Air Force where proper regard has not been given to this factor in the design of training equipment.

5. Recommended action:

a. Service policy and practice - It is recommended that additional personnel with the proper training and experience be provided for the purpose of providing human engineering consultation during the design stages of training device production.

b. Additional research is needed to determine how the learning effects of the nature or specificity of the knowledge of results provided varies as a function of such variables as type of task, difficulty of task, and stage of learning.

DIRECTION OF MOVEMENT AND THE USE OF CONTROL KNOBS TO POSITION VISUAL INDICATORS

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1. Statement of topic: Direction of movement and the use of control knobs to position visual indicators. If the instruments and controls used in aircraft are to be operated most efficiently and accurately, particularly in critical situations, it is desirable that they function in a manner constant with the operator's expectations or previous experience.

2. Applicable data: Considerable research has been done by this and other laboratories to determine the optimum or preferred motion relationship between a control and that indicator which it controls, e.g. it has been found that a) if several control indicator units are operated alternately or in sequence, operators work most rapidly and with least variability when the relative position of and the motion relationship between indicator and control are alike; b) a counter-clockwise motion relationship between a rotary control and its corresponding indicator is conducive to rapid performance; c) the removal of any operational inconsistencies in a series of similar tasks will probably increase speed and accuracy of operation; d) it appears that direction of motion considerations are particularly important in control systems that are operating infrequently, such as emergency controls.

The generality of application of such findings is now being investigated in relation to various designs of and configurations of controls and displays.

3. Appraisal and summary of data: It appears that principles such as above may be applicable to single controller systems. However, consideration must also be given to the multiplicity of the controller

system which is found in most aircraft installations. Since it is believe that, to avoid confusion, complex groups of instruments and controls should be constant in their mode of operation, principles such as the above should be applied with caution to individual controller systems.

4. Service policies and practices: Direction of motion stereotypes have apparently not been given adequate consideration in the design of cockpit, radar and bombing equipment. It is believed that blindly following a policy such as is implied in the Handbook of Instructions for Design Engineers, that clockwise, right or forward movement of the control shall always result in an increase in the quantity being controlled, may result in systems whose mode of operation is contrary to such principles as were listed above.

5. Recommended action:

a. It is recommended that an agency be established whose function it would be to interpret and translate laboratory findings to design engineers, or that design engineers be advised to contact the Psychology Branch of the Aero Medical Laboratory to assist in the solution of direction of motion problems, or that such information be more adequately disseminated to design engineers.

b. Additional research is indicated concerning the generality of application of the proposed direction of motion principles to various control configurations and concerning their application in situations where many controls must be operated simultaneously or in rapid succession.

EVALUATING CONTROL SYSTEMS

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1. Statement of Topic: Lack of attention to basic criteria for evaluating control systems. The practice of studying the effects of modifications in existing equipment has directed attention away from the basic question of whether or not the control system being used is the best one for the task.

2. Review of applicable research data or principles: The research data from which this problem derives are too diverse to enumerate within the scope of this report. The problem may be illustrated by the use of rotating knobs to make settings on linear scales when available data indicate that devices employing translatory motion allow a 50% reduction in the time per settings.

3. Appraisal and summary of data: See (2) above. In general, evaluation of proposed designs should be based initially on the "control task" rather than on "device manipulation".

4. Service policies and practices: At present the limited use of human engineering specialists in the development of equipment is usually initiated after the basic design has been established. As a result, modification is all that is possible. More often the human engineering specialist is consulted after the equipment has been produced and performance has been found to be something less than adequate.

5. Recommended action: Inclusion of human engineering specialists in those groups who are responsible for the evaluation of original design layouts in the development of control equipment. These specialists may be full-time members of the group or simply consultants, but in either case their status should be so defined as to insure that proper weight be given their recommendations.

HABIT INTERFERENCE
CAUSED BY ILL-CONSIDERED DESIGNS OF MILITARY EQUIPMENT

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1. Applicable data: There is a vast literature on human learning showing the interference and inefficiency which result from conflicting habits. Habit interference is particularly disrupting when in a new task familiar stimuli require a new set of responses. This latter kind of situation is all too common in Air Force equipments, particularly in airplane cockpits. A very large proportion of the pilot error aircraft accidents result from misuse of controls because of conflicting control positions and mode of operation. The value of aircraft lost each year through this cause alone runs into many millions each year.

2. Appraisal and summary of data: A summary of research data on the effects of conflicting habits would be too voluminous to present here. That conflicts in habits are a source of error and inefficiency is so well known that no further elaboration would seem necessary.

3. Service policies and practice: There are numerous Air Force practices which fail to give adequate allowance for the effects of habit interference.

a. The cockpits of current aircraft have virtually no standardization as to control and instrument positions and manner of operation. Cockpit standardization is being applied in new aircraft, of which none are yet in general use. Higher Air Force backing for the cockpit standardization program is not sufficiently forceful to insure ultimate success.

b. Air Force pilots are permitted to shift freely from one to another type of aircraft, without sufficient transition training to overcome conflicting habits.

c. There is not an adequate educational program to acquaint pilots with the differences between cockpits and the hazards created in specific aircraft after previous flight in another type.

4. Recommended action:

a. The following changes in service policy are recommended:

(1) Increased funds, personnel, and authority for the cockpit standardization program of the USAF and the U.S. Navy Bureau of Aeronautics.

(2) At the present time aircraft cockpit mock-ups are rarely attended by psychologists or human engineers who are particularly alert to habit conflicts. It is recommended that all aircraft cockpit mock-ups be attended by a psychologist or similarly trained person to check for undesirable design features from the standpoint of pilot habits and capabilities.

(3) Greater restrictions on pilots with regard to flight in unfamiliar aircraft.

(4) More effective education of pilots with regard to the hazards in unfamiliar aircraft because of conflicting habits.

b. Additional research, particularly analysis of pilot error accident causes, is recommended.

INSUFFICIENT ATTENTION TO HUMAN OR PERSONAL CAUSES OF AVIATION ACCIDENTS AND INEFFICIENCY IN MILITARY AVIATION OPERATIONS

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1. Applicable data: Accident statistics over many years from the USAF Directorate of Flight Safety Research have shown approximately 70% of all aircraft accidents to have been caused by pilot error. Studies of bombing accuracy obtained through pilot interviews by the AAF Redistribution Command during World War II (AAF Aviation Psychology Program Research Report No. 14) revealed that errors made by flight personnel constituted the predominant cause of bombing mission failures. There are many other types of evidence to show that the actual performance military aircraft, in the hands of military personnel, falls considerably short of the equipment capabilities. Much of this results from inadequate selection and training of operators, but a large proportion of the performance loss comes about from failure of the equipment to be designed to suit the operators' capacities and previous training in civilian life.

Since World War II considerable human engineering research data have been accumulated which indicate the value of designing equipment to suit the human oper ... Minor changes can, in many cases, double or triple the accuracy and efficiency of the man-machine combination. This research has shown how poorly human-engineered are many pieces of military equipment. It has also evolved many design principles which can be applied to the improvement of such equipment and has shown the directions toward which future research should be aimed.

2. Appraisal and summary of data: (See above).

3. Service policies and practices: At the present time vast sums are being spent for the development of equipment which will be mechanically

and electrically superior to their previous counterparts. Many of these equipments, however, will give only mediocre performance when operated by the normal military operator, for whom the equipment is too complex and difficult to operate. In many cases better results would be obtained by the use of simpler equipment better suited to the operator's needs and capabilities.

The actual expenditures of the military services in research and development aimed toward improving man-machine combinations is insignificant in relation to expenditures for new engineering developments. Furthermore, the existing knowledge in human engineering is not being fully utilized and applied to new equipment.

4. Recommended action:

a. The major action which would be required is as follows:

(1) Increase in civilian and military personnel for in-service research, development, and application of data in the human engineering field.

(2) Increase in funds for research in human engineering.

(3) Place psychologists or others with human engineering experience in positions of authority where policy and planning with regard to equipment development could be influenced.

b. The greatest need is for additional research, as indicated in 4a above.

LACK OF CONSISTENCY IN AIRCRAFT FLIGHT INSTRUMENT PRESENTATIONS

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1. Brief: Aircraft flight instruments in current use, and being procured for future use, utilize two conflicting principles of presentation. Most instruments give a "fly from" type of presentation, in which the instrument pointer represents and follows movements of the aircraft. Other instruments give a "fly to" presentation, in which the pointers represent the relative position of the earth or a fixed radio beam. Current instruments utilizing the "fly from" type of presentation are the rate of turn, heading, altitude, rate of climb and air speed indicators. The "fly to" type of presentation is used in the gyro horizon, ILS cross pointer, and Zero Reader cross pointer indicators. Psychological research has consistently shown the superiority of the "fly from" principle for flight instruments. More serious, however, is the conflict between different instruments in the same flight group. Such conflict is well known to increase the load upon the pilot and the chances of instrument reading errors. The conflict in presentation principles is a particular handicap to newly trained pilots, and without doubt increases training time and cost.

2. Review of applicable research:

References:

a. Loucks, R. B. An experimental evaluation of the interpretability of various types of aircraft altitude indicators. Chap 8, Aviation Psychology Program, Report No. 19, 1947.

b. Browne, R. C. Comparative trial of two altitude indicators. Flying Personnel Research Committee, Great Britain, Report No. 611(a), April 1945.

c. Gardner, J. F. Direction of pointer motion in relation to movement of flight controls, USAF Air Materiel Command Technical Report No. 6016, June 1950.

d. Warrick, M. J. Effects of motion relationships on speed of positioning visual indicators by rotary control knobs. USAF Air Materiel Command Technical Report No. 5812, October 1949.

The first three of the above reports agree in showing the superiority of the "fly from" direction of movement with the moving instrument element representing the aircraft. The fourth report shows the unfavorable effect on human performance of a conflict in types of presentation.

3. Appraisal of research data: The data are clear and consistent in showing the undesirability of conflicting methods of presentation, and in the superiority of the "fly from" type of presentation.

4. Service policies: (See 2 above).

5. Recommended action: Action is required to redesign aircraft flight instruments so as to eliminate conflicts in types of presentation. To obtain the most satisfactory presentations will require additional research, development, and evaluation.

THE ROLE OF ATTITUDE RESEARCH IN STUDYING HUMAN BEHAVIOR UNDER CONDITIONS OF MILITARY SERVICE

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THE ROLE OF ATTITUDE RESEARCH IN STUDYING -- "HUMAN BEHAVIOR UNDER THE CONDITIONS OF MILITARY SERVICE."

- PAUL D. GUERNSEY -

NOTE: The terms of reference used to amplify General McNarney's directive setting up the "Working Group on Human Behavior" indicated that -- "ways and means should be emphasized by which present knowledge concerning human behavior can be more effectively utilized to increase the efficiency of the armed forces."

The comments here presented are intended only to serve the purpose stated above.

ATTITUDE RESEARCH IN THE MILITARY SERVICES

General

The purpose of conducting scientific studies of the attitudes of military personnel is to aid in intelligent and informed planning of operations.

Attitude research studies, whenever applicable to a decision, establish an upward line of communication to provide the policy-maker with objective, quantitative facts; policy-makers do not have to depend on hearsay or subjective impressions based on limited observations.

An attitude research study is <u>not</u> a form of inspection.

Military inspection, which describes <u>actual conditions</u>, and attitude research, which reveals men's <u>reactions</u> to those conditions -- both provide important information for realistic planning.

Attitude research studies are <u>not</u> a means of military personnel "voting" on how to run the military service; and it is not a function of the researchers to tell any staff agency how to do its job.

An attitude research study provides the policy-maker with <u>one additional kind of information</u>. Obviously, the policy-maker must regard information from attitude studies as one of many factors bearing on any specific problem. The policy-maker must evaluate such information in the light of his experience and his knowledge of such other considerations as fiscal policies, training facilities, manpower requirements, possible political factors, etc.

<u>Specific Operational Procedures</u>.

<u>Services</u>

The Attitude Research Branch exists to plan, conduct, or supervise attitude assessment studies required by the Office of the Secretary of Defense; to coordinate attitude assessment studies among military personnel of the Armed Forces, and upon request by any of the separate Departments, to provide assistance to that Department in connection with attitude and opinion studies.

The Branch does <u>not</u> initiate studies -- it is an operating service agency. The services of the Branch are available to officials concerned with policy formation and personnel management. The staff can furnish information gleaned from past studies, and submit advice on whether proposed studies could reasonably be expected to furnish relevant information needed for planning purposes.

The attitude Research Branch carries on a program of communications research to "copy-test" informational materials (motion pictures, radio programs, etc.) of the Armed Forces Information and Education Division, to determine how they will be accepted by the audience for which they are intended.

Policy

Requests for attitude assessment studies may come to the Branch through either of two channels. If the research problem is one which has policy connotations for more than one Department, the study request is sent through Department channels to the Chairman or the Director of Staff, Personnel Policy Board, and thence to the Chief, Armed Forces Information and Education Division. Technical problems, and those research problems of interest to only one Department, may be channeled from the Department direct to the Chief, Armed Forces Information and Education Division.

Techniques

Upon receipt of a request for an approved study, the Branch arranges a study conference at which the research analyst assigned to the project and the request originator meet to discuss the purpose and scope of the study. A study plan is prepared in which techniques for obtaining the desired information are outlined and the population to be studied is specifically determined. The principal research tool used by the Branch is a self-administered questionnaire, specifically designed for each study conducted. After pretesting, and preparation of the final questionnaire, the final sampling plan is designed and officers (some of whom may be furnished by the Department which requested the study, and given brief but thorough training by the Branch to conduct field work) take the questionnaire forms to selected installations throughout the country to be filled out by the types of respondents called for in the study plan. Completed questionnaires are returned to Washington for analysis and reporting.

UTILITARIAN NATURE OF

ATTITUDE RESEARCH

Discussion

Primarily, attitude research studies in the military services serve a utilitarian purpose.

Studies originate as a result of problems existing at a specific time -- and in a specific population at that time, in military service

The studies are designed to provide, as quickly as possible, information for practical application.

Under these circumstances, attitude studies do not lend themselves, readily, to following a long-range research design which will yield a coherent, organ body of scientific principles.

This does not mean, however, that over a period of time the information accumulated has revealed nothing beyond what was of practical significance toward solving immediate problems.

It is possible that certain reaction patterns may emerge when accumulated information is carefully analysed. Such reaction patterns, if they exist may of themselves be informative and useful. (For example, they might serve as a valuable guide for anticipating present and future problems in which attitude research could provide useful quantitative measurements

The condition discussed here has been well stated in Chapter I of Vol. I, THE AMERICAN SOLDIER (Stouffer, et al.) --

"It must not be forgotten that the Research Branch was set up to do a fast, practical job; it was an engineering operation; if some of its work has value for the future of social science this is a happy result quite incidental to the mission of the Branch in wartime. That the Branch was able to be of use to the Army is a tribute to such background of theory and techniques and practical experience as exists in our cultural heritage. That its contribution to the verification of scientific hypotheses of some generality is severely limited is a

result, not only of the fact that the Branch had an engineering not a scientific mission, but also of the fact that theories of social psychology and sociology and techniques for verification are still in a relatively inchoate and primitive stage of development in our culture. Detailed and searching analysis of the information accumulated over a period of years from attitude research studies is a very time consuming process.

The first volume of THE AMERICAN SOLDIER was published in 1949 -- over three years from the date when work was begun on the reanalyzing and collating the information accumulated during WW II.

An operating unit such as the Attitude Research Branch has neither the personnel nor the working time to be spared to undertake a long-range re-analysis and collation of the information accumulated during the past five years.

Recommendations

The two volumes of THE AMERICAN SOLDIER have been prepared primarily for a reading audience with some training in the social sciences and statistics. It is recommended that --

The material in these volumes should be rewritten expressly for military use. (Some suggestions as to how this might be accomplished appear in the book review section of the INFANTRY JOURNAL, June 1949). (See enclosure I.)

The list of the reports prepared by the Attitude Research Branch from 1946 to the present time is attached. (See enclosure II.) It is recommended that --

This list (and any of the reports considered pertinent) be reviewed for any implications of long-range military value. (Such review could be accomplished by the Working Group on Human Behavior or competent consultants designated by the Working Group).

If such review indicates potential value of military worth in having certain parts of the information re-analyzed and collated, a contract should be given to a competent civilian agency to undertake the project. (It is assumed that such a contract would be so negotiated as to provide for general supervision and technical consultation by the professional staff of the Attitude Research Branch).

A PROPOSED PROGRAM OF ATTITUDE ASSESSMENT STUDIES RELATED TO THE CURRENT MOBILIZATION

Purpose

The program of attitude studies here proposed is designed to obtain objective information concerning adjustment to military life of various groups of men in active military service. Certain types of adjustment problems associated with a mobilization program undoubtedly can be anticipated on the basis of previous experience. To determine the degree to which these anticipated adjustment problems exist, the Attitude Research Branch should now prepare itself -- if requested -- to furnish timely, factual information to those charged with the responsibility associated with high-level planning of policies and procedures. Such information could be made available to the policy-makers from a series of studies as outlined below.

This series of attitude assessment studies could also serve to detect and measure new problems that may arise during this mobilization -- problems which may be unparalleled in previous military experience. Provision would have to be made, therefore, to alter the design of the series of studies should unique problem situations present themselves, or, should dramatic changes occur in the military situation.

Factual information from this series of attitude studies could be useful to policy-makers as a guide in:

a. Planning new calls of men to active military service;
Information on the relative adjustment of the initial groups of selectees, reservists, and National Guardsmen entering the active military service would be helpful in determining the most efficient utilization of the total manpower pool should further, but incomplete, mobilization be necessary.

b. Planning for the training of leaders;
The series of studies would present leaders with objective information showing where special attention must be directed toward improving the over-all morale situation.

c. Planning for the training of recruits and newly activated units;
For example, which kinds of men need to be sold on the importance of their job, unit, or branch of service? In which areas do men feel their training has been inadequate?

d. Planning for the effective utilization of units;
For example, as an advance measure of combat proficiency it is important to know which types of units feel most confident in their combat skill.

e. Planning for the information program in the military services.
Realistic planning for the information program can be aided by the knowledge of the present amount of information on matters of importance, and by men's degree of conviction about why they are fighting.

Type of Information to be Obtained

As visualized at present, the type of attitude information which might prove most useful is as follows:

a. Personal identification with service role -- Which men are most willing to serve? Do men with active military service in World War II,

for example, feel that they have already fulfilled their duty to serve? How do men feel about serving overseas or in combat? Which men feel they can be of most use to their country by serving in the Armed Forces? Are there great differences in personal identification between reservists, National Guardsmen, selectees, etc.? What are the reactions to the draft and re-call policies?

b. Personal esprit -- What sort of psychological difficulties do men have in making the basic adjustment to service life? What worries do they bring with them from civilian life? How do men feel about their physical and mental condition? What concerns do they have about the immediate or more remote future?

c. Views on international situation -- How strongly do men support our participation in the United Nations Action in Korea? With what intensity do men hold the belief in the necessity for curbing "communist aggression"? Is there agreement on goals of the United States and the United Nations? How well are men informed on vital issues, contributions of other nations, etc.? On what subjects do they feel a need for further information?

d. Attitudes toward leadership -- What problems in "human relations" are emerging in the present expansion? How are men reacting to their leaders in the early training situation? In advanced training? Are attitudes toward leaders related to the civilian backgrounds of new men?

e. Attitudes toward assignment -- What need for further training do men feel? Do men feel that their abilities are being utilized to as great an extent as possible? How do men view the importance of the role of the various services, branches, and their own unit?

f. Satisfaction with specific environmental aspects of military life -- How do men feel about the relationship between the military and civilian community? What services need to be provided by the Armed Forces? Which by the civilian community? What are men's reactions to the basic requirements of food, clothing and shelter offered by the services?

Method

The initial effort in this program would provide for a series of studies among new components of military manpower with comparative studies among Regular armed forces personnel. Field work, production, and analysis plans would be directed toward timely delivering of information on each of various components of manpower listed below, in whatever sequence the policy-makers consider most essential.

In the immediate future the following groups could be isolated for intensive comparative study with Regular armed forces personnel and with one another.

a. Selectees

b. New volunteers

c. Reserve components called to active duty

d. National Guard units in Federal service.

The composition of each service, in terms of the ratio of Regular to non-Regular personnel on active duty, will be changing rapidly in the future. As long as this dynamic situation exists, the emphasis in this series of studies would be upon comparisons among groups rather than upon presentation of over-all results for an entire service.

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DEVELOPMENT OF SATISFACTORY EAR PROTECTIVE DEVICES

ACOUSTIC TRAUMA INCURRED BY GUNNERY TRAINING IN THE ARMED SERVICES

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ACOUSTIC TRAUMA INCURRED BY GUNNERY TRAINING IN THE ARMED SERVICES

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1. Many pieces of research over the past half century and more (including some performed in the various Armed Services) have shown unquestionably that hearing can be and is frequently damaged by the blasts and explosions connected with the firing of military weapons. Further, it has been shown that such damage can be lessened if personnel have access to and wear ear protective devices.

2. In this laboratory, many men have been found to have auditory deficiences which can be traced to the firing of some sort of weapon while on duty in one of the Armed Services. Examples are artillery fire of the Army, heavy caliber guns aboard naval vessels, and the rifle and machine gun ranges of the Air Force. Questioning of these men has determined that although ear protective devices are sometimes available, they are not universally so. Moreover, the need for and effectiveness of these devices has never been explained to the men. They, therefore, disdain to wear them.

3. Recommend that ear protective devices be made readily available at all places in the Armed Services where gunnery training of any sort is performed (including the skeet ranges). Further, recommend that regulations be instituted and enforced to the effect that such devices will be worn by all personnel at all times when they are firing or when they are close to a firing range.

DEVELOPMENT OF SATISFACTORY EAR PROTECTIVE DEVICES

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1. Currently available ear plugs have the following drawbacks:
   a. There is no one model which will fit all shapes of ears adequately.
   b. Even if the plugs shut out noise well, they are often uncomfortable.
   c. The plugs are small and difficult to insert and remove, especially by men with blunt fingers and short nails.
   d. Mechanics working around airplanes usually have grease, fuel, dirt, etc. on their hands, and cannot keep ear plugs clean. Foreign matter is then introduced into the ear canal and can cause irritations.
   e. Individually molded ear plugs attenuate noise well and are more comfortable, if carefully made, but still are difficult to manipulate.
   f. Under the best circumstances, no ear plug affords, by itself, sufficient protection against the high intensities of noise generated by jet aircraft at full power and by all aircraft engines running in test cells.
2. The following recommendations are submitted:
   a. That several types of plug in all sizes be readily available in operations offices and other places close to sources of noise.

b. That steps be taken to devise new protective devices which will be comfortable and which can be handled indirectly by men with dirty hands.

c. That a helmet or ear muffs, to be worn in addition to ear plugs, be devised. Sound-attenuating muffs attached to the standard billed cap worn by aircraft mechanics might serve the purpose. The muffs could be pulled down and secured by a fastening under the chin during very intense noise, and could be pushed up and fastened on top of the head when not required.

d. That top priority be granted to development of the above.

FAILURE OF WEST POINT, ANNAPOLIS AND USAF OCS GRADUATES TO PASS HEARING REQUIREMENTS FOR FLYING

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1. Among graduates of West Point, Annapolis and the USAF OCS who have been examined here for auditory acuity prior to flying training, have been many for whom the test was their first. Their hearing had been examined by the whisper method, but not by audiometer. Of the group, a sizeable number have failed to qualify. Others who had been examined by audiometer and had passed were found not satisfactory when re-examined here. The West Point and Annapolis graduates have been commissioned in the Regular Air Force prior to arrival here, despite the fact that hearing requirements for such a commission are more strict than are those for flying. The tendency has been, therefore, to waive their hearing defects on the basis that the Air Force might as well get the most out of them that is possible. The OCS graduates, holding only reserve commissions, are sometimes waived and sometimes not, depending upon the severity of the hearing loss.

2. The situation described needs remedying for three principal reasons:

a. Time, money and effort of the Air Force are wasted by processing and eliminating men who would never have been accepted for training in the first place, had they had proper examinations.

b. There is a chance that men to whom waivers are granted may suffer further loss rapidly and thus lose or diminish their usefulness to the Air Force.

e. The men are almost universally completely surprised to find they have any hearing loss, and certainly to find they have one which is disqualifying for flying. In most cases they have counted upon flying for years and have no other plans for the future. The emotional shock is tremendous.

3. The following steps are recommended:

a. That USAF hearing acuity requirements for flying be disseminated to both Annapolis and West Point, and that individuals interest in flying careers be urged to have hearing examinations early in their course; and again immediately before graduation.

b. That audiograms be administered as part of the OCS entrance examination for information purposes.

c. That men who fail the exams be informed that flying is out of the question for them, and that their interests be channeled along different lines.

PROBLEMS OF APTITUDE AND ACHIEVEMENT TESTING
INTERVIEW PROCEDURES IN SELECTION AND ASSIGNMENT OF PERSONNEL
TRAINING AND LEARNING METHODS

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I. Problems of Aptitude and Achievement Testing.

The following considerations of the present status of selection and testing procedures may serve to indicate how present knowledge and research findings in this area may be utilized by the armed forces.

I. 1. Excellence of present research and development program on aptitude and achievement testing procedures.

Vigorous, extensive and well-planned research programs are now underway in the various branches of the Department of Defense. These programs include work on new testing techniques, the application of known methods in the field of test development, and the actual utilization of the material developed. In this area of aptitude and achievement testing, the research and development side of the picture is amply taken care of, and should be continued, since there is constant need for new developmental work, and the revision of the instruments already in use. The suggestions given here, regarding testing, are made on the assumption that the research activities will continue at something like their present level. Granted this, the major comments will relate to the administrative practices and procedures in the routine operational use of testing procedures.

I. 2. Industrial Quality Control methods necessary for administration of large-scale testing programs.

Large-scale testing programs in which large numbers of candidates are tested at many different centers by a number of different examiners must be carefully watched if adequate standards are to be maintained. The results of these tests at induction or training centers are very important to the candidate. They may be used as the major basis for deciding whether he is to be inducted into the military service, or to go to school; what type of military service he is to perform; or whether he is or is not to be advanced in the military service. Under such circumstances many of the recruits will make every effort to improve their score in these tests; and various sorts of coaching plans and schools will offer coaching to improve one's test score. It is very likely that more effective coaching will be available to some recruits than to others, hence some will enjoy an unfair advantage over others. Correspondingly from the viewpoint of administration of the tests it is likely that conditions may vary widely from center to center or from examiner to examiner. For example during World War II testing was sometimes in large rooms furnished only with benches, and with noisy machinery in operation nearby. Instructions regarding timing were sometimes not clearly understood or accurately followed by test administrators. It is necessary for the central supervising agency to be continually on the alert in order

that the tests utilized at each stage will be fair to all the men affected by them. (Gulliksen 1942)

Currently, the most rapid, economical and accurate methods of keeping watch on the quality of a large mass of items are the procedures known in industry as the methods of "quality control" of the product. These methods are due largely to the work of Walter Shewhart (see Shewhart, 1931). A good recent work on quality control methods is Grant, 1946. Applications of these methods to clerical work and achievement testing have been described by Jones, 1947, and by Sichel, 1949. The methods for the control of testing results developed in the United States Army Air Forces Aviation Psychology Program during World War II are described in their Research Report No. 18 by W. L. Deemer Jr. 1947, (see especially chapters 5, 15, and 18).

The Quality Control methods cannot be described in detail here. They consist essentially in watching for unusual increases or decreases in certain measured values. In case under consideration one would look for unusual increases or decreases in average test scores from different groups, or for unusually large or small variability in test scores. Such quality control methods have been applied with considerable success in continuing large-scale programs in South Africa, and have given the persons in charge of these programs an immediate indication

of irregularities in the conduct of the examinations and of unsuspected variations in some of the apparatus that was used, (see Sichel 1949). Gulliksen 1942 indicates some errors found in routine testing in the Navy.

It is strongly recommended that such Quality Control procedures be adapted for use in maintaining standards in any large-scale and continuous testing that is undertaken in the defense establishment.

The quality control methods will not of themselves determine what is wrong. They simply serve as green or red lights. When the quality control checks are satisfied, one may say that he has the green light and can move ahead with the program feeling reasonably assured that operations are proceeding smoothly. When the quality control checks are not satisfied, this serves simply as a warning red light. Something is not going correctly. It may be that a skilled person can simply inspect the results and make a shrewd guess regarding the nature of the difficulty, or it may take special investigations to track down the trouble and correct it. In either case one makes the indicated changes and then tries again to see if the quality control criteria are satisfied by the new conditions. If they are, then one moves ahead. If not, one looks further for the difficulty and changes something else, and then tests again. This procedure is repeated until things appear to satisfy the quality control criteria again.

The references given to Grant, Shewhart, Jones and Sichel illustrate in greater detail the sorts of information obtained by a quality control program.

I.3. Time limits on tests.

The quality control methods mentioned in the previous section serve to give an over-all indication that procedures are all right, or that something is amiss. There are however certain precautions that may be taken in setting up a testing program that will lessen the probability of difficulties arising. One of these has to do with setting time limits for tests. Some tests are, of course, essentially speed tests -- for example a test of typing or stenographic or radio code speed -- and must be administered as such with very careful control of time limits. Especially careful quality control checks should be introduced into the administrative procedures for such tests. The more usual type of aptitude or achievement test however is not of necessity a speed test. However, such tests must (under the usual administrative conditions) be operated with time limits since it is necessary to keep the men moving and not to delay an entire group for the sake of a few unusually slow individuals. For such tests it is highly desirable to fix the time limits so long that small errors in timing, such as shortening or lengthening the time allowed by a minute or so does not seriously alter the scores of the individuals taking the test. Unless such ample time limits can be allowed, much more careful quality

control checks must be instituted.

I. 4. The value of direct measures of the skills or knowledge to be tested.

Often in measuring various skills needed for the military services it is awkward to measure the skill directly and one is tempted to use indirect measures for administrative convenience. For example the direct method of measuring one's proficiency in disassembling and assembling a given weapon is to have the person perform the task under standard conditions. Often this is time-consuming, necessitates the presence of additional personnel to supervise and evaluate the quality of the task, and is inconvenient in that one or more specimens of the weapon in question would be needed. In such a situation the temptation is to utilize the administratively convenient device of a paper pencil test which asks questions about the weapon. Such tests can be given to large numbers of persons with essentially no special equipment, and a minimum of supervisory personnel. Furthermore it may be demonstrated in many cases that there is a reasonably high correlation between the quick and easy paper pencil test and the cumbersome and inconvenient apparatus test. However, in spite of the administrative convenience of the paper and pencil tests, it is desirable to use the more combersome direct approach wherever possible (Gulliksen 1950). Over a relatively long period of time, the effect of such direct tests upon the attitudes and

the training of the men will probably be very beneficial. Work of this sort was undertaken by Research Project N-106 for the United States Navy during World War II. Some of the results in the achievement testing field are described by Bray 1948, and Stuit 1947. More detailed descriptions of the tests developed and the results achieved by their use are found in the research reports of project N-106; see Conrad 1945 for a summary report. For more detailed reports regarding the tests for various schools, see Bown, Engle and Bechtoldt 1945 (signalmen), Bown and Gulliksen 1945 (Radio Code), Frederiksen 1945 (landing craft schools), Frederiksen 1946 (Gunner's Mates), Frederiksen and Monroe 1945 (Gunner's Mates), French and Bown 1948 (radio code), Harsh 1945 (torpedoman), Peterson 1947 (20 mm. Gunnery), Thompson and Frederiksen 1945 (electrical schools), United States Army Air Forces Aviation Psychology program, especially reports numbers 8 to 13 inclusive.

For example, if a given achievement test involves the actual assembly and disassembly of guns, then the men in coaching for such a test will actually attempt to assemble and disassemble the guns. This is exactly what they should be practicing. Contrast such desirable practi with the type of coaching that would be undertaken for a test that was known by the men to be purely a paper and pencil test dealing with the names and definitions of various parts of the guns. Intensive coaching or cramming

designed to improve a man's performance on such a paper and pencil test would probably be entirely of a verbal memory sort, and hence not contribute nearly as much to the development of useful skills as would coaching for the performance tests. The beneficial effects of direct measures of performance in motivating proper efforts on the part of both students and instructors is shown in the material reported in references cited previously in this section. It is felt that every effort should be made to utilize direct measures of performance whenever possible. If it is essential to resort to indirect measures then unusually careful quality control checks must be made or the program may change radically before this change is realized by those responsible for administering it.

I. 5. Special problems of differential assignment.

Problems of "selection" are radically different from problems of "differential assignment". Selection problems arise when there are a certain number of vacancies for one type of job, with more applicants than positions. One then wishes to pick the best of those applying, and to reject the rest. Appropriate procedures for this problem are well-known.

The contrasting situation is one in which there are many different types of jobs, and the available men are to be distributed among the jobs so as to utilize available manpower to the best advantage. This is the problem of differential assignment. It is a totally different and much more difficult problem. A beginning has been made on the

solution of this problem (see Mollenkopf 1950); some Air Force Research projects attempting to work out different solutions are under way. Some workable approximations may be found in the near future, and should be watched for and put to use as soon as possible.

I. 6. Problems of quotas assigned to service schools.

A part of the problem of "differential assignment" lies in the methods by which "quotas" are determined for the different jobs. For example when the Navy recruits finished boot training they were assigned to one of a number of service schools, or to sea duty. The determination of quotas for the different service schools was made entirely (as far as I could determine), on the basis of best estimates of the future needs of the service. These needs seemed to fluctuate widely, with the result that the assignment officer was forced to "scrape the bottom of the barrel" to make school assignments by "skimming the cream" another month. Quotas for the different training centers apparently were assigned without taking into account the quality of the men at the various stations. The efficiency of the results would be greatly improved if there were provision for rapid communication <u>from</u> the assignment center regarding the nature of the <u>present supply of men</u> to be assigned. Then the quotas could be fixed not only in the light of the probable future needs of the service, but also in the light of the present nature of the supply. (To utilize an everyday analogy, quotas were determined by a process like sending an order to

a wholesale house for certain items with no information whatever regarding the items which were in stock. The procedure usually followed is to first study the catalogue and to order only what is in stock.) A rapid communication system should be arranged between the assignment centers and the office which fixes the quotas, so that the quotas could be adjusted to the supply available for assignment. For example if an unusually large group of potential radar mechanics are available at a certain center this fact should be known and taken into account in fixing quotas.

II. Interview procedures in selection and assignment of personnel.

II. 1. Interview methods result in lower average quality for the selected group.

During World War II, a great deal of time, man-power, and expense was devoted to giving each man a personal interview prior to his assignment. One study made of the efficacy of this procedure for the electrical school (Conrad and Satter 1945) showed that better men would have been assigned to the school had the assignment been made entirely on the basis of test scores unmodified by the judgments of the interviewer. There have been several different attempts to evaluate the contribution of the interview to a selection program; (see Burgess 1928, Davis 1947, Dunham and Moltzer 1946, Dunlap and Wantman 1944, Kelly and Fiske 1948. Symonds 1942, Snyder et. al.

1944, Super 1949, and the United States A.A.F. Aviation Psychology Program, Research report No. 5 by Guilford and Lacey). For the studies that have been made, the general finding is that if a good test, or test battery is available (one with a validity of .4 to .6) interview procedures do not increase, and may decrease the quality of the selected group.

The conclusion on the basis of the evidence now available seems fairly clear. If one has a selection problem and has a battery of tests that give a validity of .4 or higher with some acceptable criterion, then interview procedures as usually handled, will not increase the validity of the selection procedures.

Since clear cut procedures for differential assignment are not now available, there have been no studies of the use of the interview as a supplementary device in the problem of differential assignment. The difficulty of the problem however is greater than that of selection, so it seems reasonable to believe that the interview will not improve, and will probably injure the results that would be achieved by the use of any reasonably good testing program.

If the use of the interview is to be justified, it must be on grounds other than that it improves the validity of a selection program. Let us turn to the consideration of such other possible grounds.

II. 2. Interview for appraisal of personal characteristics.

In certain special cases the interview may be valuable for aiding in the determination of personal characteristics that should influence the selection procedures. One frequently hears that interviews are appropriate for assessing such characteristics as "emotional adjustment" or "personality." However, it seems probable that for such characteristics well designed questionnaires of the "personal inventory" type can do a better job than an interview. (see Bray 1948, pp. 74-82)

However, if characteristics such as "personal appearance" or "neatness of dress" are found to be important a personal interview properly standardized, and with a specific scale to fill out would probably be a very good method to use. Similarly, if it is desirable to check "voice defects" or the "ability to speak well before a group," a properly designed interview before an appropriate group with a standardized rating scale would probably be the best method of assessment, (see Bray 1948, pp. 138-143)

The foregoing material illustrates the sort of "personal characteristics" which it is reasonable to believe can be better assessed by personal judgment in a well-standardized interview than by the group paper and pencil methods of testing.

II. 3. Interview for arriving at a series of interrelated decisions.

Face-to-face contact in a personal interview also

seems to be necessary in another type of situation. In planning a coordinated program of study, or devising the tactics that would be most suitable for a given engagement, it seems to be very necessary that the parties concerned talk directly to each other. Each person possesses information that may be relevant to the decisions reached by another person, and it is also necessary that early decisions influence later ones, and sometimes even necessary to reconsider an earlier decision because of some problem that arises much later in the planning. If the assignment of personnel is made under a plan whereby both officer and recruit contribute information that affects the decisions of the other, then a fairly lengthly interview procedure would be desirable and might be necessary. It would seem however that such interviews would necessarily not be short, and might have to be arranged in several sessions so that there would be time between sessions to obtain additional information, or to give more careful consideration of information already obtained. Such assignment procedures might be possible at specialized training centers that dealt with relatively small numbers of men but could not be used at recruit training centers where large numbers of men must be rapidly assigned.

II. 4. Possible beneficial effects of interview on morale.

It remains to consider one final possibility. It may be desirable to have every man interviewed so that any

gross slips in the objective techniques can be detected, and so that each recruit will be able to say that he had a chance to express his own personal opinion to the person who made the final decision. Thus, if the man had a violent dislike for any given assignment, or felt very strongly that there was a particular assignment he wished, it would be possible not only to take this into account, (which could be done by a paper and pencil preference or interest inventory) but also to explain misconceptions to the person, and thus make him see that possibly some of his preferences should be altered. It might well be that the alternative procedure which might be described by the men as "assigning on the basis of little holes in cards" would produce measurably more dissatisfaction with the results of the assignment, even though from an objective viewpoint the final result would actually be better.

II. 5. Conclusion.

The foregoing material on purposes of the interview in selection and assignment of personnel is important partly because if the purpose of the interview is explicitly stated it is possible to adapt the interview situation more accurately to that purpose, and partly because the evaluation of the success of the interview procedures should be in terms of its purposes. In the present state of our knowledge about the interview it seems reasonable to state that wherever reasonably good tests are available the modification of assignment in terms of an interview will probably result

in a poorer selection. Thus the interview should be designed for, and evaluated in terms of other purposes; such as its possible beneficial effect on morale in some cases, or its value as a means of testing certain personal characteristics such as speech and appearance.

III. Training and Learning Methods.

III. 1. Additional research effort desirable in the area of methods of training and learning.

The relatively small amount of effort devoted to devising new training methods, trying them out and comparing the effectiveness of different methods, stands in marked contrast to the extensive program for development of aptitude and achievement tests. It seems likely now that as far as the military selection and training program is concerned, the major advances at present are to be made in the field of training methods. Organizing special experimental schools in which various training methods could be utilized under controlled conditions and accurately compared would be one method for making advances in this field. In most cases the general principles which are known in the field of learning must be adapted by special research for each new area to which they are to be applied.

III. 2. Efficient length and spacing of training periods.

Many studies on this topic are reported in the learning literature. A summary of this material is found in

McGeoch 1942, Melton 1950, National Society for Study of Education 41st yearbook part II 1942, and Woodworth 1938. In general in the fields studied it has been found best to make the learning periods relatively short with one to three or more days between periods. No general rules are available that one can use to specify the most efficient length and spacing of training periods for a new task. It would be necessary to investigate each subject matter and to try out different types of training schedules to see which was most effective. However, all studies agree in showing that long training periods on a single subject are poorer than some type of spacing of shorter periods. Bray 1948 pp. 123-125 reports a radio code study showing that in radio code one class studying four hours a day for five weeks learned as much as another class studying seven hours a day for five weeks. Thus it is highly probable that wherever administrative arrangements could be worked out some sort of spaced learning would be superior to the massed practice now used. For example it might be superior to assign the students directly to some type of service school and then to alternate class periods with the drill periods required for basic training. The general research results now available indicate clearly that it would be well to determine the efficiency to be achieved by such procedures. We cannot of course predict with confidence just what distribution and length of practice periods would be best in the military situation.

III. B. Desirability of "real" training situations indicated by studies showing the specificity of learning.

During the past fifty years there have been many studies on the extent and nature of "transfer of training" from one type of situation, skill or activity to another. Such material is summarized in McGeoch 1942, Melton 1950, Guthrie 1935, Smith and Guthrie 1921, Thorndike 1914 and 1932, NSSE 41st yearbook 1942, and Woodworth 1938. In general these studies agree in showing that there is very little transfer from one situation or type of activity to another. Even slight readjustments in background, such as changes in general room lighting, or introduction of odors will measurably disturb performance in controlled experimental situations. Such specificity of learning means that in the military situation training should be designed as far as possible specifically for the uses to which it is to be put.

For example, if close order drill is given during recruit training it should be pointed toward the precise uses which are to be made of the skills developed during drill. If, for example, it is found that the major use of close order drill is to move men quickly on and off trains and ships, then the drill should be limited to such maneuvers, and practiced to the degree of skill necessary to obtain appropriately rapid embarking and disembarking. Any general attitudes of mind, such as "obedience to authority" are not developed as a transfer effect from close orde drill. If such obedience is to be taught, it is necessary

to analyze the different types of situations in which obedience is required, or in which disobedience is likely to occur, and then to give the recruits special practice, so far as is possible, with that type of situation, or situations as closely similar as possible. In the days of the Macedonian Phalanx, close order drill was probably a much more valuable tool for use in battle than it is now, and much more extensive close-order maneuvers would probably be necessary. If, in modern warfare it is necessary to secure coordinated action between men who are rather widely separated in space, then it would be desirable to give considerable practice in movements of that type.

The use of real situations and actual equipment should be instituted wherever possible, in preference to the development of analogue equipment of various types. For example, the development of electronic anti-aircraft gun trainers gave rise to various difficulties. It was necessary to prove that practice on the equipment actually improved performance on the guns. It was necessary to check continually to be certain that due to special quirks of some sort it was not possible to make a good score on the equipment by the use of cues which the student was not supposed to use, and with such equipment it is necessary to recheck repeatedly to be certain that the equipment is in good shape since it may get out of adjustment or deteriorate. In using actual equipment practice with equipment that has deteriorated because of use would be extremely valuable because under battle conditions it may become

necessary to utilize such equipment effectively. Some experiments on the generality of tracking training are reported in Bray 1948 pp. 200-201.

In general then, because of the specificity of learning, because of the difficulty with which transfer of training is obtained, and because of special difficulties that are encountered with specialised training apparatus, it is desirable wherever possible and as soon as possible to utilize the actual equipment, in the actual situation for training.

III. 4. Knowledge of results as immediately as possible.

It has been found generally that learning is more efficient when the person knows after each response whether that response was correct or incorrect, and if possible in which direction the error lay (see, for example, Thorndike 1914 and 1938, Woodworth 1938, Young 1938, McGeoch 1942, Melton 1950). Many of the military training methods proceed without the utilisation of this principle of effective learning. For example, in learning radio code in some training situations it is possible for a person to copy incorrectly for a fairly long period before learning that he is making an error. Experiments reported in Bray 1948, pp. 121-123 show that the code-voice method which gives immediate knowledge of results is a superior method of training. In practice with the 20 mm. guns, they are typically fired at a sleeve, but the men do not know how far off their aim is or in which direction. Only occasionally is the sleeve hit, and then since a large battery of guns are firing

at it, it is impossible for any of the gunners to tell who hit and who missed. Correction of the firing in terms the judgment of expert observers stationed near the gun is also likely to be seriously in error. A very careful study of some of these problems in anti-aircraft gunnery is presented by Peterson 1947. This study presents a development of proficiency measures for various 20-mm jobs, including accuracy of firing. (See also Bray 1948, Ch. 6 & 7) It is probably worthwhile to go to considerable effort in construction of special training apparatus provided the purpose of that apparatus is to give immediate knowledge of results to the students. It may be that this result can in some cases be best accomplished by elaborate changes in the total setting of the class instruction. For example, in order to give students on the range-finders immediate knowledge of results during training and furnish a real situation, the training station at Fort Lauderdale arranged to have a plane fly a specified course; had the students record range at certain specified times designated by signals, and also had a skilled observer make recordings at identical times using more accurate radar methods. Thus, between each run of the plane the students obtained the correct answers to the set of readings they had just taken. Such care and coordination of activites exercised in training should result in much more rapid improvement in accuracy of range finding, than would practice in which the student did not know whether he was right or wrong; or than would practice in which the

student did not know whether he was right or wrong; or than would practice in which the correct answers were found by triangulation from distant observers, , since these answers would generally not be available for a day or two. Initiation of this work is described in Bray 1948 pp. 179-182. Knowledge of results as immediately as possible increases efficiency of learning. Every effort should be made and considerable ingenuity and expense is worthwhile to insure that the student obtains knowledge of results as immediately as is possible.

III. 5. Value of disturbing situations introduced during learning.

In view of the evidence regarding the relatively small amount of transfer of training under the usual laboratory and classroom learning conditions and the evidence on the distrubing effects of slight and apparently irrelevant changes from the learning situation, (see, for example, Thorndike 1914, 1932, Smith and Guthrie 1921, Guthrie 1935, Woodworth 1938, McGeoch 1942, Melton 1950) we can see that it is very desirable to have the student practice under various sorts of unfavorable conditions during his training period. It is interesting to note in the study of Karlin and Curtis 1945, that a task which involved learning was most affected by oxygen deprivation and excess carbon dioxide. If a bombardier has practiced precision bombing only on smooth runs under favorable

conditions, one could predict that he would perform very badly during his first run made through anti-aircraft fire. In order to train the students so they will not be thrown off their performance by enemy attack, it is necessary that during the latter part of training they make bombing runs under conditions simulating enemy attack as closely as possible. Similarly, in order to inshre that range finders will be able to take accurate ranges during a battle it is necessary to begin to simulate these conditions during the training. It would probably be undesirable to introduce such disturbing conditions early in training. It is necessary to see that the correct habits are established under relatively favorable conditions. However, it would be very desirable to introduce various disturbing conditions of a mild sort as soon as the student has the habits well mastered, and to increase the severity of these disturbances as rapidly as feasible without disrupting the student performance during the training period. This would apply with especial force to any type of skill that is to be performed under battle conditions.

If such explicit drill in resistance to distractions is not given during training, it is fairly certain from what is known about the psychology of learning that the student will fail to perform properly when first introduced to actual battle conditions. It may be that such disturbances in performance would be minimised if battle conditions were simulated as closely as feasible during the latter portion of the training period. A program for

training telephone talkers which provided for controlled introduction of battle noise is described in Bray 1948 pp. 138-151.

III. 6. Benefits of over learning.

Practicing a skill considerably beyond the point at which a perfect performance was first reached is refer to as "over learning." In general one finds that remembering is better, forgetting is slower, and the habit is more resistant to disturbance from various sorts of changes when it has been over-learned. This means that in order to guard against loss of skills during a battle one should use not only the methods of practice under disturbing conditions as mentioned in the previous section, but should also utilize as much over-learning as is practicable in each particular case. This principle of over learning is recognized in the case of pilots by giving additional credit for additional solo flying hours. Similarly, a student who has maintained a specified radio code speed such as 20 or 22 words per minute for two or six months is a better bet than a person who has attained such a speed only a week ago.

For any skill such as marksmanship, flaghoist, bombing, piloting, radio receiving or sending, as much provision as possible should be made for overlearning during training, and some definite provision should be made for seeing that a man gets credit on his permanent military record both for reaching a given level of skill,

and for maintaining that level or higher, for longer and longer periods.

III. 7. Necessity for periodic reassessment of skills.

Any newly learned skill is forgotten at a fairly rapid rate if it is not practiced. The evidence is summarized by such references as Bartlett 1932, McGeoch 1942, Woodworth 1938, and other surveys of the psychological literature. Furthermore, a well-motivated and conscientious person may spend his spare time in practicing old skills or learning new ones, so that instead of having forgotten and becoming poorer at the end of six months or a year, he has improved. In order both to guard against th effects of forgetting, and to reward the persons who utilize their spare time for improvement it is desirable t have periodic and systematic rechecks on all important skills. Ansbacher 1948, reports that according to regulations in the German Navy, each man was to be tested every two to six months by his superior officer and the score to be entered in the man's permanent record book. This applied to such skills as radio code receiving or sending speeds, for which a clear-cut test and test-score were possible. Such a system of periodic rechecks of each man on relevant skills, and making the results a part of his permanent record would be extremely valuable in insuring against forgetting and in encouraging practice on the part of the man.

In thosecases where it is feasible, the man's superior officer might make such checks at fairly

frequent intervals. The appropriate interval would probably be different for each type of skill. In some cases it may be that the testing for relevant skills can best be done at reassignment centers, since they could have the equipment, the directions for standardized tests, and the personnel to administer them. In particular, whenever a man is to receive a refresher course, or a new course in some subject, or is to be assigned to a type of duty involving certain skills, it is essential to give an appropriate series of tests to be certain that he has the requisite level of skill for the duty, or for the course work to be undertaken. Some of the problems encountered in attempting to obtain uniform records, and to make them available to line officers, are discussed by Gulliksen 1944, and Peterson 1945.

It is well to emphasize again here the material on the value of direct rather than indirect methods of measurement. If such periodic rechecks are instituted it is imperative that the tests be such that the men will be encouraged toward the proper type of practice during the periods between tests. For example, if a paper-pencil test of descriptions of parts of guns is used, the effect would not be as good as if the tests consisted in the actual assembling and disassembling of the guns, finding and repairing defects, or using the guns. Such operational tests for various types of special skills required by the Navy are described in Brown, Engle and

Bechtoldt 1945, (Signalmen); Bown and Gulliksen 1945, (radio code); Frederiksen, 1945, (landing craft); Frederiksen and Monroe 1945, (gunner's mates); Harsh 1945, (Torpedoman); Peterson 1947, (20 mm. gunnery); Thompson and Frederiksen 1945 (Electrical Schools). Various types of special skills required in the Air Force are described in United States Army Air Forces Aviation Psychology Program, Research Reports, No. 8 Pilots; No. 9 Bombadiers: No. 10 Navigators, No. 11 Flexible Gunnery, No. 12 Radar Observer; No. 13 Flight Engineer. A general description of the work done by Project N-106 for the Navy is given by Conrad 1945. General summaries are presented by Bray 1948, and Stuit 1947. A tremendous amount of performance test material prepared during World War II is thus available for use in a program of systematic periodic rechecks of various military skills.

III. 8. Provisions for advancement and retraining.

The provisions mentioned in the preceding section regarding periodic rechecks on military skills would be much more effective as far as motivating the men is concerned, if it were possible to give definite military recognition of some sort for excellence. Prizes or special mention of some sort might be given for especially good performance. If the table of organization permitted, advancement in the service could be the reward for sufficient improvement. If it is administratively possible

to tie the periodic retesting program to advancement or special reward of some sort, the effect in motivating spare time practice and study might be considerably increased.

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UTILIZATION OF WACS BY THE ARMY

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Prepared for
THE WORKING GROUP ON HUMAN BEHAVIOR
UNDER CONDITIONS OF MILITARY SERVICE

Department of Defense
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UTILIZATION OF WACS BY THE ARMY

-Col. Halleran-

World War II proved to the Army that the utilization of women in time of war is a necessity and an established fact. Although womanpower had been utilized in most of the nation's wars in a civilian status, it was not until 14 May 1942 that a military corps of women, other than nurses, was actually established by law. On that date Public Law 554 establishing a Women's Army Auxiliary Corps was signed by the President.

The mission of the Women's Army Auxiliary Corps was to release soldiers for combat duty and to make available to the National Defense the knowledge, skill and special training of the women of the nation, organized into units and trained for noncombatant services with the Army of the United States. The successful accomplishment of this mission depended upon the proper and successful utilization of the members of the Corps.

At the inception of the Corps in 1942, only 54 jobs in four general occupational fields -- clerical, motor transport, communications, and cooking -- were open to WAC enlisted women. In addition, enlisted women were assigned to fixed companies set up according to pre-established Tables of Organization, all of which were the same size and comprised the same number of cooks, typists, drivers, etc. These Tables of Organization did not always fit the requirements of the field and the inflexibility of the numbers, type, and grades of personnel prescribed by the Tables restricted the using agencies in complete utilization of the WAC personnel.

The major problems in effective utilization which presented themselves from the formation of the Women's Army Auxiliary Corps until September,

1943 were due to the fact that the Corps was established by law to serve with the Army rather than in the Army.

On July 1, 1943 the President signed Public Law 110 which gave to the Women's Army Corps full military status as a component of the Army of the United States.

The War Department changed its assignment policies for enlisted women by authorizing the assignment of WAC personnel as casuals to fill authorized vacancies for military personnel. This change in policy enabled using agencies to requisition enlisted women in numbers and Military Occupational Specialties according to their particular requirements.

By November, 1943, WAC enlisted personnel were performing 155 jobs in eight occupational fields and by April, 1945 the number of jobs expanded to 250. Gradually it was determined that there were actually 40% of the 628 jobs in the Army which could be done by women. It was decided however, that concentration on 239 jobs which were particularly suitable for women would insure the best utilization of the number of personnel involved. These jobs fell into eight general occupational fields, as follo Administrative and office; technical and professional; motor vehicle; foo supply and stock; mechanical and trade; communications; radio and electrical. (See Appendix A)

The scope of jobs performed by WAC officers broadened considerably a the number of officers was increased. Originally WAC officers were assig only to those jobs concerned with the administration of WAC personnel. With the assimilation of the Women's Army Corps by the Army, WAC officers were used to replace male officers on a one-for-one baris, and it became

possible for them to be assigned to virtually any job in the Army (other than combat) for which they proved to be qualified. By June 1945 approximately two-thirds of the WAC officers were assigned to staff work and operational duties and were performing 202 of the 779 different Army officer jobs. (See Appendix B)

At the peak strength of approximately 100,000 (5,800 officers and 94,000 enlisted women) members of the WAC were serving at more than 400 installations in the Z/I and in all theaters of operation. Approximately 18,000 members of the Corps had overseas' service.

The Army worked consistently for the proper utilization of WAC personnel and at the same time attempted to allow field commanders as much leeway as possible in assignment. Following are some of the policies which were established on utilization of WAC personnel:

1. Enlisted women will not perform permanent kitchen police duty.

2. Members of the WAC will not be used in restaurants, cafeterias, service clubs, guest houses, officer's clubs, or messes, except in administrative positions, and then only if utilization of military personnel in such positions has been authorized.

3. Members of the WAC will not be employed as physicians and nurses.

4. Members of the WAC will not be employed in laundries except in administrative positions.

5. WAC personnel will not operate permanent wave machines or give permanent waves by machineless methods, unless licensed by a State Board of Cosmetologists or State Agencies having jurisdiction over such matters.

6. No enlisted woman will be eligible for assignment to overseas service if her disciplinary record contains a serious or major offense;

if the company punishment record indicates repeated disregard of regulations and standards of good conduct; or if she has not been a commendable member of her unit.

7. No officer or warrant officer of the Women's Army Corps will be considered eligible for assignment overseas if her record and behavior have not been excellent or better.

8. WAC personnel will be used to replace civilian personnel only in those cases in which the substitution of military for civilian personnel has been approved by the War Department as a military necessity.

9. Enlisted women who are qualified as Medical Department Technicians will not be assigned to duties other than those for which they are qualified as Medical Department Technicians.

10. Enlisted women will not be used in enlisted men's messes, except when enlisted women's messes are combined with those of enlisted men in the interest of economical operation.

11. Female personnel will not be used to make initial classification and assignment interviews of male military personnel.

12. Enlisted women may operate vehicles not in excess of 2½ ton capacity.

After demobilization and prior to the passage of permanent legislation for women in military service, a relatively small number of WACS remained on active duty. With no future service guaranteed, many of them returned to civilian life. The Army was convinced, however, that it was not only desirable to have WACS in the peacetime organization, but it was also necessary to have them. They would provide a nucleus of well-trained military women whose organization could be rapidly expanded in time of emergency.

Congress and the public were also convinced for on June 12, 1948 Public Law 625, 80th Congress, "The Women's Armed Services Integration Act of 1948," was signed by the President. Title I of this law provides for the enlistment and appointment of women in the Regular Army and in the Organized Reserve Corps. A ceiling of 7500 Regular Army enlisted women, 75 Regular Army warrant officers, and 500 Regular Army officers was established for the first two years subsequent to the passage of the bill. Thereafter the WAC strength shall not exceed 2% of the Regular Army strength.

No limitations are placed on the utilization of women by law. The law states that the WAC shall perform such services as may be prescribed by the Secretary of the Army. The mission of the WAC today as stated in Army Regulation is to provide for the assimilation and appropriate utilization within the Army of volunteer womanpower of the nation (exclusive of female officers of the Medical Department). Army regulations provide that WAC personnel will be utilized only in Military Occupational Specialties established by the Department of the Army.

Attached as Appendix C is SR 615-25-36, WAC MOS Assignment, dated 15 November 1950. This regulation contains the basic principles considered in establishing jobs to be performed by enlisted women in peacetime and the jobs to which enlisted women may be assigned. At present, enlisted women are utilized in the following enlisted career fields:

Personnel and Administration	55.72%
Medical	15.77%
Communications	6.83%
Supply	4.72%
Food Service	3.83%
Motor Transport	2.75%

Scientific Services	2.51%
Finance	2.02%
Information	1.43%
Mapping and Reporduction	1.10%
Photography	.88%
Special Services	1.02%
Machine Accounting	.84%
Military Intelligence	.18%
Military Police	.13%
Quartermaster Maintenance	.07%
Communications Intelligence	.03%
Chemical	00
Automotive Maintenance	.16%

Enlisted women are not utilized in the following career fields:

Armored
Artillery
Infantry
Engineering and Construction
Engineering Equipment Maintenance
Ammunition
Armament Maintenance
Army Aircraft Maintenance
Wire Maintenance
Electronics
Marine Operations
Railway

Mobilization would necessarily broaden the field of utilization of enlisted women. At such time there would be only two limiting factors which would effect the jobs enlisted women could do. Namely, the jobs to be performed must be noncombat in nature and must not require physical strength greater than usually expected of women. Many jobs in the career fields now excluded for utilization of enlisted women (see preceding paragraph) could be performed by enlisted women.

Although the WAC officer strength is greatly reduced from that of wartime, the utilization of these officers is given great consideration and study. The career of WAC officers follows, in general, the policies

established for male officers of the Army. Appendix D, Change 1 to TM 20-605, "Career Management for Army Officers", explains in detail the WAC Career Pattern.

One basic problem regarding utilization of women by the Armed Forces presents itself on mobilization if women are procured by voluntary enlistment, which is the present procurement policy. In order to attract capable women, the standards for enlistment must be kept relatively high. The women so recruited should be utilized in jobs commensurate with their ability. There are, however, some routine jobs to be done which would be boring and frustrating to highly-competent individuals. If mental and educational standards are lowered in order to obtain personnel who will be adequate to do lesser skilled jobs, well-qualified women criticize the services for not being "selective" and do not apply themselves. So, actual utilization of women by the services under a voluntary recruiting program is effected, or actually limited, by public opinion.

Utilization of military women is also effected by the attitude of military men toward women in the services. For the most part, military men who have had military women serve with them are the strongest champions for their wide utilization. And, contrariwise, those who have not had military women serve with them, while not, for the most part, opposed to utilization of military women, are often extremely conservative in their plans for such utilization.

In order to assure extensive and proper utilization of military women in time of mobilization the public must be informed of the need for, and the utilization of, military women in the Armed Forces. In addition,

military men must also be educated to know how and to what extent militar women can be utilized. When planners automatically think of military man power as being men and women, half of the battle for proper utilisatior · women will have been won.

APPENDIX A

Utilization of WAC Enlisted Personnel By General Occupational Field a/

General Occupational Field		% to Total Enlisted Women According to Personnel Survey as of 30 Sept 1944
I.	Administrative and Office	49%
II.	Technical and Professional Medical and Hospital Technicians Personnel Public Relations Physical Sciences Photography Drafting Miscellaneous	18%
III.	Motor Vehicle	9%
IV.	Foods	9%
V.	Supply and Stock	6%
VI.	Mechanical and Trade	4%
VII.	Communications	5%
VIII.	Radio and Electrical	2%
	TOTAL	100%

a/ According to percent occurrence of Military Occupational Specialties within general occupational fields. (See TM 12-427 - Military Occupational Classification of Enlisted Personnel - 12 July 1944)

APPENDIX B

Utilization of WAC Officers

Functional Groupings a/		% of WAC Officers According to Machine Records Report - 30 June 1945 b/
I.	Communications and Transportation	3%
II.	Administrative, Executive and Training Services	69%
III.	Medical, Dental, Veterinary & Other Health Services	1%
IV.	Procurement, Supply, Maintenance and Repair Services	15%
V.	Welfare and Special Services	7%
VI.	Fiscal, Accounting and Budgeting	2%
VII.	Professional Engineering and Related Technical Services	.4%
VIII.	Professional, Subprofessional and Scientific Service	.6%
IX.	Protective, Intelligence and Investigative Services	2%
	TOTAL	100%

a/ Functional groupings of Army jobs as listed by Military Occupational Specialty in TM 12-406, "Officer Classification, Commissioned and Warrant," February 1946.

b/ Percentage of occurrence by Military Occupational Specialties within Functional Groupings based on Machine Records report on 4688 WAC officers, 30 June 1945.

Appendix C of original report:

Department of the Army Special Regulation 615-25-36
ENLISTED PERSONNEL
WAC MOS Assignment

Appendix D of original report:

Department of the Army TM 20-605
CAREER MANAGEMENT FOR ARMY OFFICERS

HISTORY OF UTILIZATION OF WOMEN IN THE NAVY

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Prepared for
THE WORKING GROUP ON HUMAN BEHAVIOR
UNDER CONDITIONS OF MILITARY SERVICE

Department of Defense
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HISTORY OF UTILIZATION OF WOMEN IN THE NAVY
and
Certain Personal Observations of Human Behavior - Nov 1942 to Feb 1951

WORLD WAR I.

Between the years 1900 to 1918, women in the U. S. had been emerging from the shelter of the home to seek employment in the business and industrial world. By 1918 their competence in the clerical and stenographic field and as telephone operators had been generally recognized. In these fields, particularly, their acceptance on the job had passed the "innovation" category, because the women had proved their ability, had not disrupted or revolutionized the world of work, but rather had quietly taken their places, were at least as efficient as their male predecessors, and were generally available at a fraction of the pay.

Just prior to the U. S. entry into World War I, the Navy shore establishment's need for clerical assistance became much greater than had been anticipated. It was found that no appropriations were available to pay additional civilian personnel and furthermore that the Civil Service Commission would be unable to furnish even one-tenth of the number required.

Examination of the Act of 29 August 1916, which established the U. S. Naval Reserve Force, revealed that the word "male" had not been used. The Secretary of the Navy accordingly authorized the enlistment of women in the rating of "Yeoman". No women served as commissioned officers. At the time of the Armistice there were 11,274 Yeoman (F) in the Navy. It is to be noted that the original concept of utilization of women in the Navy was in the field in which they had proved themselves in the civilian world. However, before the end of the war, other capabilities were recognized and they were assigned, in addition to clerical, additional duties including drafting,

fingerprinting, as translators and telephone operators. It is believed that, if the war had continued, the number and types of billets for Yeoman (F) would have been broadened.

All Yeoman (F) were discharged from the Navy by 31 July 1919. No plans were made for an inactive reserve status or for utilizing women's services in future emergencies. However, a precedent for the use of women in the Navy had been established and their competence in certain duties proved and accepted.

WORLD WAR II.

The outbreak of World War II for the U. S. found the Navy with no plans for the utilization of women. Several bills to permit this were introduced in the Congress without Departmental sponsorship. Seven months after the Pearl Harbor attack, however, on July 30, 1942, Public Law 689, approved by the Navy Department, was signed by the President. This bill authorized the commissioning and enlistment of women in the Women's Reserve of the U. S. Naval Reserve.

Early thinking envisioned the utilization of approximately 10,000 women. This number was quickly discarded as the requests from naval activities, principally the Bureau of Aeronautics and the Bureau of Medicine and Surgery, were received in the Bureau of Naval Personnel. On VJ Day, there were 86,000 Waves on active duty; 78,000 enlisted and 8,000 officers.

During the years 1942 to 1945, the scope of utilization of women in the Navy expanded in a manner almost incredible in the light of deep-seated convictions on the part of a great number of male naval officers that their services should be confined to the clerical fields if permitted

to serve at all. Greater acceptance of the services of women came as the Navy reached the bottom of the manpower barrel. That personal conviction on the part of male personnel of the Navy is still encountered in connection with women in service in the regular Navy, but is not as evident as during the initial days of the war program. The exception to the foregoing statements was found in the thinking and planning during World War II for the utilization of women in the field of naval aviation. Before enactment of legislation to permit women to serve in the Navy, the Bureau of Aeronautics prepared plans and requested that approximately 23,000 enlisted women be assigned to the aeronautic organization. It included women in general service ratings and those to be trained in the various aviation ratings. This number was based on types of work it was believed they could perform successfully and the numbers in each field of work where they could replace men in the shore establishment. It is of interest to know that on VJ day there were 22,200 women being utilized in the naval aeronautical organizations.

Aviation Training - Enlisted Women

In setting up the training for enlisted women in naval aviation, the existing training facilities for men were utilized. Instruction was co-educational. The subject content was identical.

It is believed that the co-educational training was the most significant policy adopted by Naval Aviation Training Division. It is believed to have definite advantages on a number of grounds over and above that of economy of cost of additional facilities and teaching staffs. The primary advantages were (1) economy in individual adjustment to the service. Women who were trained in separate schools and then went to duty stations

where they worked side by side with great numbers of men had a decided adjustment to make. Women trained with male trainees, under approximately normal service conditions, had an opportunity to make this adjustment while in training. (2) Identical training and healthy competition with male trainees permitted the women to go to duty station knowing just how they stood as compared to male trainees. This is important to any behavior pattern. On the other hand, the men also know that the women in their rating had been through the same training routine and had in many instances bettered him in class standing.

This co-educational method of training went a long way toward the acceptance of women on the footing of equal ability. It was constantly observed that performance curves extended upward where men and women trained and worked together. The old behavior pattern existed in which a man does not want to be inferior to a woman and the woman wants to show how well she can perform. The following chart summarizes, in small space, the enlisted aviation training accomplished:

Rating	Length of Course	No. Trained
AMM (Aviation Machinist's Mate)	21 weeks	2,731
AM (Aviation Metalsmith)	21 weeks	236
SP(T) (Link Trainer Instructor)	10 weeks	1,701
SP(Y) (Control Tower Operator)	6 weeks	602
PR (Parachute Rigger)	12 weeks	419
AerM (Aerographer's Mate)	12 weeks	650
SP(X)(P) (Pigeon Men)	24 weeks	20
AMM(I) (Aviation Machinist's Mate--Instrument)	15 weeks	649
SP(G) (Gunnery Instructor)	6 weeks	606

Rating	Length of Course	No. Trained
SP(P) (Camera Repairman)	6 weeks	51
SP(V) (Transport Airman)	6 weeks	200
LCNT (Link Celestial Trainer Operators)	10 weeks	235

In addition to the above, small numbers of women qualified either on-the-job or at schools as Aviation Ordnancemen, Aviation Radio Technicians, Aviation Electrician's Mate and Aviation Storekeepers.

The rapid technological advance in naval aviation during the war and the constant and intensive experimentation opened many hitherto unexplored fields. Personnel assigned to work in these fields were trained on the job. The highly specialized tasks were, for the most part, not yet covered by ratings when the war ended. Women proved highly satisfactory as laboratory technicians in the aviation assembly and repair laboratories, as operators of the then secret aviation ground control devices, as the technicians and operators in the Navy's night fighter training project.

Aptitude tests for selection and screening of the women to be trained in the aviation ratings were applied during the woman's basic indoctrination training. In addition, the Bureau of Medicine and Surgery (Aviation Medicine Section) contributed carefully studied psychological and physical factors, the latter to insure that each field of work would permit the efficient and safe utilization of women without taxing her physical capabilities. The basic requirements in two different ratings are given as examples:

Parachute Rigger:

Pronounced physical stamina

Strength of fingers

Keen sense of responsibility

Height of not less than 5' 6"

Control Tower Operator

Minimum Test Scores - GCT 55; ARI 45

Visual acuity 20/20 corrected (min. of 15/20)

Normal color vision

Normal auditory acuity; ears free from disease

Clear, well modulated voice. No special defects. No pronounced local accent.

No tendency to vertigo

Good hearing

Voice recording to be made before final selection for training

It was always of great interest to note that women serving in the instructional field in aviation pilot programs achieved an early, ready and continuous acceptance by the men. This is accounted for by the fact that student naval aviators were young, to a great extent fresh out of high school, and entirely accustomed to women teachers. Because of their youth, they had not the hangover thinking of older men, which greatly questi the ability of women except in minor clerical and sales positions or in work of a domestic nature.

It is interesting to note that after the program for women in the aeronautical organization got under way, no pilot went into combat who had not received some part of his training from a woman.

Tab (A) is a scholastic and statistical comparison of men and women students in Aviation Maintenance.

Aviation Training - Women Officers

It is believed that the training and employment of enlisted WAVES was accomplished more satisfactorily than was the training and employment of WAVE officers. This is attributed to two causes:

(1) The qualifications for enlistment in the Navy were high: education, morals, and age (20 to 35). These qualifications attracted the finest group of young women in the United States. The specialized aviation training carried out with the men and in men's schools was their immediate certification of ability. Further, as enlisted personnel, they worked under supervision and the results of their work were tangible.

(2) The lack of adequate information during the early stages of the war concerning the types of jobs Reserve officers were supposed to fill. This resulted in the procurement of many able women whose civilian skills were not necessarily useful to the Navy and whose civilian experience was often wasted in the Navy billets to which they were assigned. As more detailed information became available concerning the various types of officer jobs in the expanding shore establishment, the Navy was able to do better selection and training in all its Reserve officer programs.

However, in the meantime a reputation of methodical proficiency rather than alertness and imagination had been established in the minds of commanding officers, and it took at least another year to convince them that the newer group had what was needed and could assume the responsibilities of the jobs for which they had been trained. During the last year and a half of the war, the old reputation had been dispelled by (1) the demonstrated ability of later groups and (2) the remarkable adjustment to the Navy way of doing things by the first group.

COURSE	NUMBER TRAINED	LENGTH OF CO
Aerological Engineering	113	9 months
Photo Interpretation	13	2 months
Aircraft Recognition	9	2 months
Gunnery	15	
Radio-Radar Administration	121	2 months
Air Navigation Instructors	100	4 months
Link Celestial Navigation Training	46	2 months
Air Combat Information	11	2 months
Communications Procedures (to instruct aircrewmen)	20	18 weeks
Aviation Indoctrination (preparatory to W.R.R. and administration billets on air stations)	135	2 weeks

As had been done in the case of screening and selection of enlisted women for aviation training, the Bureau of Aeronautics established basic requirements for women officer training in aviation specialties. Two examples follow:

"Air Navigation Instructors:

A background of Civil Aeronautics as a pilot, ground school instructor and/or operations personnel; desirable, but not essential. A good mathematical, technical or scientific background. Analytical and inquiring mind. Good powers of visualisation, highly desirable. Teaching background not considered particularly helpful, long teaching experience not desired."

"Aerological Engineers:

College graduates with college mathematics including differential and integral calculus and at least one year of college physics with marks not

lower than C. Previous training in meteorology desirable, but not required. Should be between the ages of 21 to 35 years. Emotional stability, leadership and judgment highly necessary. (Classification staff must bear in mind that the individual will eventually be in complete charge of the aerological operations to which assigned.)"

The women officers were trained at the same naval facilities or institutions as male officers.

The foregoing material, dealing for the most part with the naval aviation field is presented and can be explained more in detail by the writer because during the years 1942 to 1946 she was assigned as Women's Representative for aviation activities. She was in a position to observe at first hand, by frequent trips to naval aviation facilities throughout the United States (1) the acceptance of women on the job. (2) The reaction of the women themselves to their new way of living and working in what had heretofore been a man's field.

General Service and Specialized Fields (other than Aviation)

Wave officers and enlisted women served in many other areas in addition to the aviation field, principally in general administration, communication, supply and hospital work. Tab B lists the ratings held by enlisted Waves during World War II; Tab C, the variety of billets in which Wave officers served; and Tab D, a summary of their utilization in various job areas.

The History of the Women's Reserve (U. S. Naval Administration in World War II, Bureau of Naval Personnel), prepared under the general supervision of the Director of Naval History, gives a detailed account of the training and utilization of Wave personnel in all fields in which they served. It is suggested that this history be consulted for additional information on the Wave program during World War II.

HOUSING

In any discussion concerning the utilization of women and effectiveness the matter of living plays a most important part.

In planning housing for women, the basic concept included the belief that women are particularly affected by their home surroundings and that their efficiency in the Navy could therefore be affected to a great extent by their living conditions. It was also believed that women would be inclined to spend considerably more time, after working hours, than men, in their quarters.

These beliefs proved to be correct.

In the conversion of existing male barracks or in the construction of new barracks for women considerable care went into the planning. Pastel colors were used for interior paint. Cubicles, rather than the open dormitory sleeping area, were erected. Doors were put on toilet compartments. Gang showers were eliminated whenever practical and dressing cubicles installed. With the age range from twenty to thirty-five, the need for some privacy in bathing and dressing was found to be a very important item, especially for the older women. Two lounges in each barracks were provided, one generally on the second deck where the women could gather informally, and out of uniform, do their nails, dry their hair, read and write. The lower lounge required the wearing of uniform and here male guests could be received and entertained. In many places, toward the close of war, hot plates and refrigerator facilities were furnished. These features for women's barracks had a fine effect on morale. Further, as believed would occur, the women made a home of their barracks to a much greater extent than men. The provision of a lounge where men could be invited brought a feeling of dignity and pride to the women. Also, it precluded the need for men and women to seek the tap rooms off station in order to meet for other

than planned joint recreational projects. The provision of adequate laundry facilities in women's barracks was another feature recognised as a necessity in an attempt to provide at least an approach to normal living. All were important factors in the adjustment to military life where large numbers, must of necessity, live closely. Some criticism was voiced and is still voiced because the same number of women as men, in view of the above facilities, cannot be housed in a barracks and therefore women are more expensive to the service. In this connection, consideration must be given to the fact that women are not by nature destructive and the cost of maintenance because of destructiveness is practically non-existent in women's barracks. Further, a woman's pride in her barracks became increasingly apparent during the war years and has continued to date. This pride is demonstrated by unmarked walls, polished floors and furniture, and individual decoration in the sleeping cubicles.

The standard for women's barracks are being maintained and will be improved when practical and possible. Refinement is one of the qualities sought by the Navy in the women accepted for service. The best practical living standards are important if that refinement is to be maintained.

PERSONNEL ATTITUDES

The introduction of women into the military services presented problems from the standpoint of the service and from the standpoint of the women.

It is my opinion that there was, at the beginning of the program, a widespread reluctance on the part of men of the Navy to accept the services of women. There were, however, many who would accept them enthusiastically for clerical work. Often this enthusiasm sprang from the fact that Navy women could work around the clock, whereas civil service employees worked a prescribed number of hours per week. However, the more forward thinking men

assumed a "can do" attitude and the women were trained in various fields and assigned to duty. As the first groups demonstrated their abilities the going became easier. The women knew they were on the spot to prove that they could do a man's job. After they accomplished this, there appeared a realization that they could do certain types of work better than men. Before the end of World War II the reluctance to accept women in place of men, and doubt as to their ability to do the jobs had disappeared. It is interesting to note that as turnover in male personnel from ship to shore occurred, a period of doubt and final acceptance again had to be faced. These periods became shorter and shorter however as the reputation the women had made was publicized.

From the standpoint of the women, problems of adjustment to the service way were also encountered. Solving of this problem entailed necessary subordination of self, and the length of time it took depended on the individual woman and her ability to strike the proper attitude. In the majority of cases, this was most readily accomplished when the women had the feeling that they were needed, and were given the opportunity to demonstrate that they could do the job assigned. During the period when the value of women services was doubted and proper responsibilities were not assigned the women became dissatisfied and their efficiency, even in routine jobs, suffered. On the other hand, when they knew that their activity expected them to turn out a top performance at all times and when the work was a challenge their morale was high and efficiency soared, and their efforts were unstinting.

From my personal observations, I state that the so-called "regimenta" of women in naval service was accepted by them as a necessary part of the life. The watches, prescribed liberty, leaves, lights out, etc., were the same as prescribed for men and the women were proving that they could do a

man's job.

In the matter of discipline, the record of women in the Navy in World War II can be pointed to with pride. This was possible, in my opinion, because of the high standards for enrollment which were set up and maintained throughout the war. In addition, the fact must not be overlooked that all women were volunteers. I knew and talked with thousands of Waves during the war. I heard none say that she derived no benefit from her service. The most frequently expressed ideas dealt with changes in the individual, which the individual could recognize and which came about in her successful adjustment to service life. The most frequently expressed were:

1. They learned to live closely with many different types of people.
2. They learned the need for and practiced cooperation.
3. They became more self-reliant and at the same time more sympathetic and tolerant.
4. They became more mentally and physically alert.
5. They learned to accept responsibility.
6. They learned to stick to a job whether or not they liked it.
7. They found they could do many new types of work and learn others.
8. They learned to live under the same rules and regulations as men and be subject to the same discipline for any infractions.
9. They learned to carry out orders without question.
10. They learned to respect the rights of others.

In my opinion, the development of these traits by the women while in service is bound to have a marked affect on her behavior pattern when she returns to civilian life. They will certainly be evident in her dealings in family life, in her job and in the community.

Women in the U. S. Navy and U. S. Naval Reserve

In my opinion, women during World War II proved not only their ability

to perform satisfactorily the work for which they were trained but also that they could make a successful and rapid adjustment to the changed environment and way of living in the Navy. With the realization that women would be needed in the future in a wartime organization, came the appreciation of the desirability to utilize their services in the peacetime organization as well. Therefore, the Navy in 1947 prepared a bill to be placed before the Congress which would permit women to be commissior and enlisted in the Regular Navy and the Naval Reserve. This aim was finally realized in the passage by the Congress of Public Law 625, the Women's Armed Services Integration Act of 1948.

Insofar as the Navy was concerned, the basic philosophy behind the b. included:

(1) The establishment, within the permanent structures, of a nucleus officers and enlisted women, which in addition to employment in regular billets will be trained and studied so that all known factors concerning their most effective utilization would be available as a basis on which to expand rapidly in the event of a national emergency.

(2) In the designation of the activities to which women will be assi and determining numbers and ratings to be allocated, decisions must be bas on such factors as need for peacetime experience in the types of duties fo which women proved particularly valuable during World War II and in which they would presumably be utilized again; to determine by special peacetime training and assignment, new specialities and types of duties to which wom might be assigned in the event of a new emergency; to assign women to geographical locations whereat the number of women properly to be employed in activities in the immediate vicinity justifies the housing provided.

Under this concept the program for women in the Regular Navy and in the Naval Reserve was set up. Approximately 1000 enlisted women and 250 officers of the Women's Reserves of the Naval Reserve were accepted for transfer to the Regular Navy.

Standards for initial appointment and enlistment from civilian life were established to include:

	Officer	Enlisted
Age	21 - 25, Ensign	20 - 31*
	21 - 30, LTJG	
Tour	Pleasure of President	Same as men
Education	Degree	High School Graduate

*On 4 April 1950 the upper age for enlistment was reduced to 26 because it was found that most problems of adjustment to peacetime naval life were found among the women over 26 years of age.

The terms of Public Law 625 limited the number of women in the Regular Navy, during the first two years of the program, to 500 officers and 6000 enlisted. However, the Navy had already laid plans to include only 4500 enlisted during that period and planned to work toward that goal.

However, the recruiting quotas established plus attrition resulted in a much smaller total. In July 1948 a group conference produced a temporary guide for the training and utilization of enlisted women in the Regular Navy. The rating structure in the Navy was studied with a view to determining wherein women could and should serve. The result was as follows:

CATEGORY I
(Highly Desirable)

1. Instrumentman (IM)
2. Opticalman (OM)
3. Teleman (TE)
4. Radioman (RM)
5. Communications Technician (CT)
6. Yeoman (YN)
7. Personnel Man (PN)
8. Machine Accountant (MA)
9. Storekeeper (SK)
10. Disbursing Clerk (DK)
11. Commissaryman (CS)

CATEGORY I (cont'd)
(Highly Desirable)

12. Ship's Serviceman (SH)
13. Journalist (JO)
14. Printer (PI)
15. Lithographer (LI)
16. Draftsman (DM)
17. Photographers's Mate (PH)
18. Aviation Electronics Technician (AT)
19. Aviation Electronics Man (AL)
20. Air Controlman (AC)
21. Aviation Electrician's Mate (AE)
22. Aviation Str al Mechanic
23. Parachute Rigger (PR)
24. Aerographer' Mate (AG)
25. Tradesman (T
26. Aviation Storekeeper
27. Hospital Cor man (HM)
28. Dental Tech (DT)

CATEGORY II
(Desirable)

1. Fire Control Technician (FT)
2. Electronics Technician (ET)
3. Aviation Machinist's Mate (AD)

CATEGORY III
(Acceptable)

1. Radarman (RD)
2. Sonarman (SO)
3. Musician (MU)
4. Machinery Repairman (MR)
5. Patternmaker (PM)
6. Aviation Ordnancem (AO)

CATEGORY IV
(Not Suited)

1. Boatswain's Mate (BM)
2. Quartermaster (QM)
3. Torpedoman's Mate (TM)
4. Gunner's Mate (GM)
5. Fire Controlman (FC)
6. Mineman (MN)
7. Machinist's Mate (MM)
8. Engineman (EN)
9. Boilerman (BT)
10. Electrician's Mate (EM)
11. I.C. Electrician (IC)
12. Metalsmith (ME)
13. Pipefitter (PP)
14. Damage Controlman (DC)
15. Construction Electrician's Mate (CE)
16. Driver (CD)
17. Mechanic (CM)
18. Builder (BU)
19. Steelworker (SW)
20. Utilities Man (UT)
21. Aviation Boatswain's Mate (AB)
22. Surveyor (SV)
23. Aviation Photographe Mate (AF)
24. Molder (ML)

A study on the utilization of enlisted women was recommended 13 May 194 It was established in BuPers as Project 6-10. One study has been undertaken to date. This consisted of a trial program conducted at a Naval Air Station.

The result was the discontinuance of training of women in the AD (Aviation Machinist's Mate), AE (Aviation Electrician's Mate) and AM (Aviation Structural Mechanic) ratings. Full information concerning this trial program and the evaluation are a matter of record in the Bureau of Naval Personnel.

Present Regular Navy.

Looking toward the utilization of enlisted women, the following training quotas have been established for Class A Schools following recruit training. Sixty percent of the women completing their recruit training may be assigned to formal school training. The remaining forty percent are assigned to duty where they receive on-the-job training. Of the 60%, the following school quotas have been established:

To Class A Schools

Rating	Percent
TE (Teleman)	10
RM (Radioman)	13
CT (Communications Technician)	10
YN (Yeoman)	5
PN (Personnelman)	5
SK (Storekeeper)	6
DK (Disbursing Clerk)	5
JO (Journalist)	1
ET (Electronics Technician)	4
HM (Hospitalman)	20
DT (Dental Technician)	5
PH (Photographer's Mate)	1
AN (Airman)	15*
	100.0

* During training in Aviation school, women are tested and classified for the schools where training in aviation specialties is carried out. These include AC (Air Controlman), AG (Aerographer's Mate), PR (Parachute Rigger), TD (Training Devices), AK (Aviation Storekeeper), AT (Aviation Electronics Technician), AL (Aviation Electronicsman) and AO (Aviation Ordnanceman).

Those women not selected for the aviation schools are assigned to duty at an aviation activity where they receive on-the-job training.

The training of women officers by the Navy is carried out with a view to their most effective utilization within the shore establishment.

Basic Indoctrination of the newly commissioned ensigns is of five months duration and is established as a part of the Navy's General Line School at Newport, Rhode Island.

Women officers commissioned in the Supply Corps receive approximately 2½ months at the General Line School before reporting to the Supply School at Bayonne, New Jersey for instruction in their speciality.

Women officers of the Medical Corps, Dental Corps, and Medical Specialist Corps receive the same indoctrination as and with the male officers of those Corps.

A career pattern has been established for the women of the Line to parallel as nearly as possible, within the shore establishment, the "rounding out" pattern established for male ensigns at sea. (Tab E - career planning article from Training Bulletin, December 1949)

U. S. Naval Reserve

The basic mission of the U. S. Naval Reserve in 1948 - "The Naval Reserve will provide the personnel necessary in time of national emergency, and upon mobilization, to man the Active, Reserve and Inactive Fleets; to provide t personnel necessary to man the Fleet shore support units both in the continenta United States and overseas; to expand the training establishment; and, in so far as practicable, to provide those specialists in all classifications who will be required in the expansion of the Navy during mobilization." - resulted in little or no provision for active participation by women reservists in peacetime programs. Nevertheless, following demobilization, the women reservists' desire to maintain their affiliation with the Navy brought about

the creation of Navy volunteer groups in many communities by the women themselves. Official recognition as volunteer groups was finally given by the Navy Department. Throughout the country the women reservists, either as individuals or as part of a recognized group were contributing their services in the evenings and on week-ends to aid the organized male Reserve Units, particularly in caring for the administrative work of the unit. With the restatement of mission for the U. S. Naval Reserve - "The purpose of the Naval Reserve is to provide a force of qualified officers and enlisted personnel who are available for mobilization in the event of a national emergency, and who together with the active and retired personnel of the regular Navy can effectively meet the needs of the expanding naval establishment while an adequate flow of newly trained personnel is being established." - forward steps in connection with the participation of women got underway. Eligibility for two weeks training duty per year was extended to women and all requests could not be granted, within the funds available.

The foregoing is offered as evidence that the desire to serve the Navy, on the part of women, did not end with World War II. The inability to continue to participate more actively brought many expressions of discouragement and disappointment.

During the summer of 1950, authority was granted for 160 women to participate in the ROC program (Reserve Officer Candidate). In addition, two weeks recruit training of approximately 500 young women reservists without former naval experience was authorized. Both programs were highly successful and the response enthusiastic.

Permission has now been granted to include a total of 40 officer and 200 enlisted women in the Organized Reserve structure.

Present and Future outlook of the program of utilization of Women in the U. S. Navy and in the U. S. Naval Reserve.

Both the present and future utilization as to numbers and scope are largely dictated by the national and international security picture. Duri times of war or even threat of war the acceptance of the fact that women have the ability to do various jobs satisfactorily appears to broaden as the seriousness of the situation increases. It should be noted, however, in such times numbers of women can be readily increased without the attend administrative problems encountered in a relatively small group. These problems include distribution, interference with male ship-shore rotation, and need for economy of housing space. However, if the existing unsettled world condition does not dictate an urgent need for determining the additi potential utilization of women in many fields in which they have not yet b tried and studied, it may be necessary to wait until we are fully mobilize to work out proper selective criteria for women in all rating fields where it is feasible to train them. This would again result in the trial and err method which is uneconomical, particularly as to time.

In my opinion there has been a successful demonstration by women dur war and peacetime that they do make a successful adjustment from civilian t Navy life without creating any major problem. The discipline record establ-lished by women in the Navy, living under the same rules and regulations as the men, demonstrates, among other things, that they adapt themselves readi to so-called "regimentation."

The ready adaption is accounted for in part by the pride they develc for the service of which they have actually been made a part. The same possessive pride comes into play that is evident in a woman for her children and for her home. There are few careers yet open to women where she can experience such an extensive feeling of being on a team. This is in additio

to her need to feel wanted and needed. When those two factors, or only the latter have been made plain, I have seen women, during the war, be content with nothing less than the utmost in performance guage her efforts. Since 30 August 1950 applications for return to active duty have been requested of women officers of the Reserve. Because of the number received, very few women officers have been recalled involuntarily. Of particular interest to me, however, have been the great number of telephone calls and letters for women officers holding important jobs in the educational, executive and administrative fields, or in business for themselves. Without exception they have asked if they were really needed, and if they were needed they preferred to be called up. All seem to feel that the Navy should know they were ready and willing to serve, to leave whatever they were doing and were only waiting to be told of the need of their services.

I believe that it will be necessary for woman to continue to demonstrate individually their ability as members of the naval service. Further, I believe they regard this situation as a challenge and react accordingly.

It is my firm and honest conviction that successful service by women in the Navy, either as a career or of more limited duration, will not only affect but greatly mould, with beneficial results, the future behavior pattern of each. The influence of these results will unquestionably be felt in the overall. The foundation for the development of tolerance, understanding, and appreciation of the responsibilities of citizenship, so necessary to the long range security program of our country, can, in my opinion, be laid or strengthened through service in the armed forces.

PSYCHOLOGIC FACTORS OF ADAPTATION IN COMBAT

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PSYCHOLOGIC FACTORS OF ADAPTATION IN COMBAT

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A. Directive

At the request of the joint Research and Development Board - Personnel Policy Board project in the Office of the Secretary of Defense, the following report has been prepared as basic material for some of the subsections in the study, "Human Behavior Under Conditions of Military Service."

Initially the sub-topics suggested were, "Unit Membership" and "Fatigue." This was later expanded, after conference with Col. Gordon L. Barclay, to include the following topics:

Organization of Group and Group Controls (K-6)

Combat Leadership (K-8)

Combat Fear, Anxiety and Fatigue (H-8)

In accordance with these instructions, a report has been prepared to include the relevant information existing in these rather general subject areas in respect to "Combat."

B. Introduction

In the event of war, the essential aim of all of the Armed Forces is to defeat the enemy, and the accomplishment of this objective involves combat. All efforts must be oriented towards the development of maximum combat efficiency if the mission is to be successful. While the need for superior planning, material and weapon improvement, logistic consideration, and so one, is self evident, in the past there has been a marked tendency on the part of governmental and military agencies to consider the human element in the equation of success purely in the light of a statistical problem - that is, "how many men do we need." Usually the basic premise in this numerical approach has been the assumption that any physically fit man can be assigned to any type of military duty

without regard for the requirements of the job or the mental and emotional capacities of the individual. Although it is difficult to present unequivocal proof, conclusions drawn from the study of large numbers of psychiatric patients, from the study of disciplinary problems, from attitude and opinion surveys, from "After Action Reports," and from other sources, make it highly probable that personnel policies based upon the premise of the unitary man contributed materially to high psychiatric casualty rates in wartime and led to an impairment of combat efficiency.

During and since World War II, an increasing amount of effort has been expended by the Army and other Services as well as civilian agencies to increase the effectiveness of our methods of appropriate use of manpower. The problem is one of extreme complexity, for not only are we forced to take into consideration the intricacies of the emotional dynamics of the individual and his complicated relationship with the society which surrounds him, but also we must study and evaluate the factors involved in the organized group of which he must become a part when he is assimilated in the Army. In addition, we must attempt to understand the relationship between various groups and sub-groups. Any personnel policy or plan utilizing men must be consonant with the needs of the individual and the group of which he is a part if it is to be effective.

It is the intent of this report to present basic information on some of the facets of the psychological factors involved in the adaptation of the individual to the tremendous stresses of combat. It is hoped that appropriate use of this material will assist in the development of the tactical and training measures which will increase the combat efficiency of the individual and his group. Since there are many deficiencies in our knowledge in this field, the need for research will be indicated when appropriate. It may be remarked parenthetically that in spite of the

importance of the field of human relations and mental hygience, research in these fields receives little support. For example, for every dollar spent in psychiatric research, we spend $65 in other medical research and $2600 in industrial research (1).

C. Factors Affecting Combat Adjustment

When any individual becomes a part of the Army, he necessarily brings with him the physical, mental and emotional heritage of his past capacities, experiences and patterns. Perhaps it is trite to mention this, but far too often this is forgotten and studies of the man's adjustment to the Army, and particularly combat, are undertaken on the implied, if not explicit, assumption that his Army career began with a metaphorically clean slate. Any competent study of adjustment must be based upon the certainty that each new experience is projected upon the screen of the individuals existing personality, and his reactions to a given experience can be understood only in this light. For example, if three men saw a snake crawl into a room, one might be terror-stricken, one only moderately surprised, and the third say, "It's a garter snake," and pick it up. Obviously the same stimulus had produced different reactions in each man and these reactions are dependent upon the personality structure and knowledge of each man.

Acceptance of this point of view makes it evident that a complete understanding of the effect of any stimulus upon an individual and his reaction to it can be based only upon a thorough understanding of the total psychodynamics of that person. Fortunately it is necessary to do a complete individual analysis of this type only for occasional research or therapeutic reasons. Nevertheless, the psychoanalytic method of investigation furnishes us with an invaluable tool for the study of some of the aspects of individual adaptation, and it has furnished valuable information

about the reasons for the failure of adjustment to combat.

In combat there is a great variety of stresses acting upon the individual, and the effect of any one or multiple of these stresses upon that person will be a product of the type and intensity of the stress in the light of its meaning to the individual. For example, the act of killing and the sight of the injured and dead will tend to have a more destructive effect upon the emotional stability of the person who has a large amount of unresolved and unconscious hostility, and in a like manner the person with unresolved unconscious homosexual conflicts will be distressed continuously by the enforced proximity of other males. Without digressing into a detailed discussion of psychodynamics, which is beyond the scope of this report, it can be stated that unconscious conflicts play a cardinal role in the ability of the individual to adjust and continue to adjust to the rigorous demands of combat. Unfortunately, there is very little that can be done to alter them by any known means of a nature practical to use in an Army setting. With a knowledge of their existence it is possible, however, to utilize procedures and means which will tend to minimize their disturbing effects, and even to make some use of some of them.

While it is necessary to keep in mind at all times the individual variations in response to stresses of different kinds, the various kinds of environmental forces tend to fall into two major categories when considered in terms of their effect upon the adaptation of the individual and the group to combat. That is, they may be either destructive and tend to decrease the ability to function effectively in combat, or they may be supportive and assist the individual and the group to carry out the mission of combat without undue loss of efficiency. In an approximate fashion, these factors may be classified as follows:

Destructive	Supportive
1. Interpersonal Relations	
(a) Inadequate Leadership	(a) Effective leadership
(b) Weak group identification	(b) Strong group identification
(c) Weak motivation	(c) Strong motivation
(d) Too harsh or too weak discipline	(d) Appropriate and consistent disciplinary policies.
(e) Disturbing domestic problems and mail and separation	(e) Tranquil home and cheerful mail
(f) Sexual Deprivation	(f)
2. Physical Factors	
(a) Danger, injury and disease	(a) Effective medical care
(b) Disturbing sights	(b)
(c) Inadequate or monotonous food	(c) Maximum effort to supply hot and varied food
(d) Ineffective equipment and weapons	(d) Better materials and weapons than enemy
(e) Fatigue	(e) Regular rest periods
(f) Climate and terrain	(f) Appropriate equipment
(g) Communication deficiencies (Military)	(g) Better inter-unit liaison
3. Policy Problems	
(a) Inappropriate Assignments	(a) Effective Assignment
(b) Indefinite combat continuation ("Law of Averages")	(b) Combat "Tour of Duty" policy
(c) Failure to integrate replacements before committing to combat	(c) Packet replacement policy and a unit integration period
(d) Disparity of privileges	(d) More equitable policies
(e) Inequitable combat rewards	(e) Distinctive combat recognition

	Destructive	Supportive
3. **Policy Problems** (Continued)		
	(f) Slow and inequitable promotion	(f)
4. **Experimental**		
	(a) Increasing fear of combat	(a) Greater "Know-how"
	(b) Retreat or unsuccessful attack	(b) Successful attack or holding operation
	(c) Weapon fea. (i.e., of especially effective enemy weapons)	(c) Better protection and counterfire
	(d) Combined operations	(d) More combined training

5. **Miscellaneous**

There are many other factors such as public reaction at home, recognition of sacrifices, leaves and furloughs, et cetera, which may affect the man in combat either favorably or adversely.

It will be apparent from an examination of this partial list of factors which affect combat adaptation that this adjustment is influenced by a large number of situations, and that the importance and relationship of these factors is both complex and variable. In fact they have been listed primarily to demonstrate that it is difficult if not impossible to study any single problem in complete isolation from the others. Adjustment to combat is in reality the resultant of the interplay of all of these forces and the impact of them on the highly unique personality structure of the individual soldier. Keeping in mind the necessity of projecting any discussion of specific problems on this complex frame-of-reference, we can proceed to a consideration of the special factors which are the subject of this report, namely, Group Organization and Control; Combat Leadership; and Combat Fear, Anxiety and Fatigue.

D. Group Organization and Controls

In the complexity of modern armies and modern warfare, it is seldom possible for the individual soldier to fight as a single entity. He must fight as a part of a team or group of teams if his efforts are to be effective. The development of coordinated group action and the maintenance of these activities in an effective form is one of the most important single problems in the training and tactical use of manpower in combat. While the individual man is the basic unit in the military group, he does not become militarily effective until he becomes an integral part of the group. The process of this integration and its continuing operation is a complex phenomenon that has been studied by a number of observers and by various methods. In spite of these investigations, it must be stated frankly at the outset that our knowledge of the constructive and destructive forces involved in group formation and continuation is rather meager. This deficiency in our knowledge has resulted, in part at least, from a failure in the means of communication between the various branches of the Social Sciences which have studied the problem. There are two major methods of studying group phenomena; it can be undertaken from analysis of individuals within the group and, from study of group phenomena as a whole. At the present time it is not possible to deduce group behavior from a study of individuals in the group, nor is it possible to infer individual reaction from observational and statistical studies of the group as a whole. It may be that methodological and conceptual considerations will continue to prohibit this translation. In the opinion of the author a correct understanding will be likely only when both methods are used to study a group simultaneously and over a continuous reasonable length of time. An attempt on the part of the author to find material of this type in the mass of unit records of World War II has indicated that such information probably does

not exist in a form which would permit definitive conclusions. There are, however, a considerable number of isolated and more or less limited studies from World War II, and it is from these and from civilian literature that the following discussion will be developed.

While any comparative study of the psychological, anthropological and psychoanalytic concepts of group dynamics and customs is beyond the scope of this report, it is necessary to attempt some broad statement of group dynamics in general. Although leaderless groups exist, all military groups of importance are confined to the general class of leader-groups In psychoanalytic and some other formulations, the prototype of such a leader-group is considered to be the family. In this family group there is a leader, the father (at time the mother), who is the director and usually the ideal of the group of children. The child attempts to imitate and be like his father and to acquire his characteristics and power. In a deeper sense, it is by reason of his emotional ties with the father and fear of loss of the father's love and support, as well as some fear of punishment, that he imitates and obeys the father. According to Freud (2), this process takes place through the complicated mechanisms of introjection and identification and the residuals of it remain within the unconscious of the individual. This unconscious relationship to the father is a dual one containing some degree of hatred and fear as well as love, and there is ample evidence of its existence in almost all individuals in the large number of psychoanalytic case studies. The ambivalent character of this primitive, unconscious relationship is of the utmost importance in studying groups in that it is reactivated to some degree whenever the individual becomes a part of any group, including the Army. In essence, it contains the capacity for strong identification with the leader of any group with which the soldier becomes a part, and

at the same time it contains the seeds of discontent and hatred of that leader should the individual feel that his emotional ties are not reciprocated. Not only does the individual identify with the leader of his group but also he identifies to some degree with the other members of his group and is bound to them by the same forces.

One of the concommitants of forming these strong intra-group emotional ties, with their powerful emotional support of the individual, is the appearance of a certain amount of regression in the individual. That is to say, there is some degree of return to more infantile patterns of thinking, feeling and behavior, and consequently a greater capacity within the group for capricious, impulsive, rebellious, persecutory, aggressive or destructive behavior which may be quite explosive in its unpredictable occurrence. It would appear that the repression of destructive and acquisitive impulses is weakened by the regression. While there are numerous examples of such anti-social behavior in civilian mobs, inter-group battles and hostility in the Army and so on, well led and strongly identified groups tend to acquire very strong ideas of proper military behavior and conduct. Proper leadership, reasonable discipline, training, and recognition of the importance of the goals by the group are among the major factors which tend to prevent disruptive behavior in military groups. However, there is a real danger of asocial behavior when these influences are weak or distorted.

The hostile and aggressive forces which are inherent in group identification can lead to partial or total disruption of the group, but much more commonly they are directed towards other groups or situations. For example, much of the emotional power involved in the combat soldiers feeling about those "rear echelon bastards," the "USO commandos," and his resistance to military "spit and polish" stems from these forces.

In the natural history of group association of the average person in our present culture, and particularly the urban man, there is a more or less continuous association with groups of one sort or another throughout life. These are the school groups, athletic teams, childhood and adolescent gangs, fraternal organizations, industrial groups, social organizations churches, and so on. Study of some of these groups has tended to confirm in a general way the validity of the theoretical considerations set forth in the preceding paragraphs. Among these are the investigations of Firth (3), Mead (4). Whyte (5), Grinker (6), Redl (7), and Freud (8). Numerous studies during the war indicated clearly the importance of the group in helping the individual withstand the rigors of combat. Among these are Bartemeier et al (9), Hanson et al (10), Menninger (11), Spiegal (12), and many others.

Perhaps the most important single factor in assisting the soldier to adjust to Army life and to sustain him in combat is his identification with the group. When the average man enters the Army he is entering an environment which is almost totally strange to him, and it is fraught with all sorts of stresses, real and imagined. There is separation from home, family, friends and familiar surroundings; he is subjected to rigid discipline, barrack life, unfamiliar food, lack of privacy, curtailed liberty, frustrations, rigorous physical demands, and loss of cherished individuality. Fortunately he is not alone in his difficulties for there are many others in precisely the same situation, and inevitably he associates himself with a rapidity dependant upon the individual, with one or two others in the same plight. He thus establishes a small spontaneous group usually with those in his immediate vicinity and thus in his unit. If he is fortunate he will continue with some of these buddies through his basic training and into his eventual unit. In the interim training and Army life, he has learned to depend greatly on the advice and help of

his buddies in many things, military and otherwise. Through force of circumstance his living habits, experiences, and judgments have been determined largely by group pressures, and these in turn affect and are affected by his previous group experiences from early childhood on. If he fails to adjust to the group to a reasonable degree, he usually becomes lost to the Army by reason of disciplinary infractions or psychiatric disability.

Usually group ties in the basic training period, with the exception of a few close friendships, are relatively loose and unorganized. When he reaches his real assignment, he again begins a new and eventually stronger group identification. He is now with a continuing unit and has a definite place in it, and his immediate group becomes relatively stable. If he is in a combat unit and is not transferred, it is this group with which he will enter combat, and the importance of strong group ties cannot be overemphasized. They are the major source of emotional support for the soldier in combat. Studies during World War II indicate strong pride in their company of the part of veteran infantrymen, 78% of them stating they were "fairly proud" or "Very proud" of their company. When asked the question of what was most important in keeping them going in combat, the four most important reasons given were: "ending the task", 39%; Solidarity within the group, 14%; thoughts of home, 10%; sense of duty and self respect, 9% (14). It is probable that finishing the war and thoughts of home are mainly expressions of a wish to end combat, whereas loyalty to the group and sense of duty are indicative of the complex forces which counter this wish. Interviews with many recovered casualties reinforce this view, as does the expression of marked guilt on the part of a great many psychiatric casualties because of having left their unit.

The most basic group in the infantry regiment is the rifle squad (15) which consists of a leader (sergeant), a second in command (corporal), and ten riflemen (privates and privates, first class). Although minor changes may be made in the composition and equipment of the squad, it is probable that this sub-unit will continue to be the basic psychological group in the infantry. In other services and other branches of the Army similar small groups will be the basic unit. In the squad, the members live together, work together, train together, fight together, and share almost all experiences. The members of the squad all know one another and each other's peculiarities and problems intimately; it is in this group that the strongest emotional ties are formed because of the close personal relationships and common experiences. Although the platoon is of importance as a group, the next major psychological group is the company. It is administratively, tactically, and from the standpoint of orders, furloughs, training and discipline a relatively self contained unit. The individual in the company tends to know many of the other soldiers in the company, most of the senior non-coms, and almost all of the officers. Through frequent personal contact he identifies with the company but to a lesser degree than with his squad because of the less intimate personal contact with the more remote company. In time of combat with the occurrence of casualties who are replaced by relative strangers, his identification with the company tends to become weaker and because of the powerful environmental stresses and danger he is drawn closer to his squad. At the same time, casualties within his squad are far more damaging to his sense of personal invulnerability and seriously threaten the sense of group support and protection. Underneath, it is the power of the emotional ties between members of this close group and the ambivalent character of the relationship which makes squad and buddy casualties so devastating to the emotional stability of the individual. This effect is of course potentiated by the fact that

these injuries and deaths are usually actually witnessed by the individual.

In order of decreasing importance in the immediate emotional support of the individual is the identification with battalion, regiment, division, corps, and Army. The inter-personal relationship is increasingly remote as the size of the unit increases, and it is upon close emotional ties that group indentification is believed to depend, at least insofar as any powerful emotional support in combat is concerned. It is unfortunate that this is the case because of the extreme vulnerability of units of company size and smaller in combat, whereas units of regimental size and larger are in a sense invulnerable since through replacement and re-establishment they continue to exist no matter how badly mauled. Furthermore, they operate in one war after another and develop a history and tradition.

In spite of the foregoing remarks about the looseness of personal identification with larger and less vulnerable combat units, there is some evidence which suggests that identification with larger units such as a regiment or division can exist. If it does, it seems probable on hypothetical grounds that the basic psychodynamic mechanisms involved must be somewhat different and more complicated than the more powerful emotional ties in the small group which gives support to the individual in the intense, life-threatening emergencies of combat. It may be something in the nature of an identification with a symbol of power, valor and indestructibility, whereas in the more personal identification with the leader of the small group there are strong inter-personal emotional ties. The eventual solution of this enigma must lie in research. In any event, the history of a number of units which have outstanding combat records, strongly suggests that there are some mechanisms which perpetuate their excellent morale and performance. Although no real evidence exists on the point as far as I am aware, it is probable that the higher morale of such units during training and rest periods, fosters better

training and more effective leadership and through these methods produce more effective soldiers and stronger sub groups thus enhancing combat competence. Certainly in the absense of evidence to the contrary, all known means of building unit pride such as emphasizing unit history and tradition, fostering competition with other units, and so on, should be used to the maximum.

To return to the internal organization of the smaller combat group, a number of studies by social scientists have clearly indicated that the interpersonal lines of communication and authority in small groups tend to be complex rather than simple (16). Of paramount importance is the leader in the group, for he is the focus of identification for the group and ideally should possess the desirable characteristics of authority. These characteristics will be discussed later under "leadership." Within the group, the leader is the final authority and arbiter, and since he is to a great extent responsible for the codes, customs and beliefs of the group in respect to their environment, he must himself abide by these rules. In the Army, he owes his authority, at least initially, to his rank and official designation as leader. If he fails to fulfill the group's concept of a leader, the group cannot disintegrate as it would in civil life, instead it ceases to be a unit whose function is enhanced by identification as a team and it becomes a group of cliques whose interests are usually disparate. Performance, morale, and discipline in a disorganized unit of this type deteriorate rapidly, and the leader usually becomes the target of a considerable amount of hostility from within the group. The leader of the squad has at least one designated assistant and not infrequently one or two spontaneously developed sub-leaders who meet the approval of the group. These sub-leaders act as unofficial liaisons in the chain of authority and communication between the leader and members of the group. They also act as unofficial advisors to the leader

and assist him in developing group policies and assist in maintaining the hierarchy of the group. In addition to these chains of command there are strong interpersonal ties which may go in directions other than the accepted lines of authority; these relationships are close and powerful and in the Army have received the designating term of "buddy" which is not far removed in sound or emotional content from its probable root word, "brother." Thus we see that the internal structure of the group tends to be organized along the lines of authority and communication between the leader and members and also along the cross channels of interpersonal emotional ties. The lines of authority are powerfully reinforced when the leaders personal attributes coincide with the emotional ideals of the members of the group.

One of the most effective means of influencing and controlling the group lies in the fact that the beliefs and customs of the group with their emotional basis in identification are the real laws which guide the behavior of the group. When these internal customs and beliefs can be made to coincide with the aims and methods of the Army, an almost unshakeable core of discipline and effective performance is instilled in the group. This ideal combination permits the group to support Army aims to the maximum, and at the same time it makes all of the beneficial effects of Army discipline, training, and method available as support for the group. While this desirable objective is easy to state, its achievement is not easy. It is attained through emphasizing the common interests of the group and thus making it more cohesive and secondly, through the influence of the leader on group customs and goals. The first of these is developed by competition in many fields, with similar groups, by similarity of activities and problems, by making its members responsible to the group for group functions, and by assuring the group a maximum of

fairness in its treatment by higher units and leaders.

The problem of the leader is very important for it is through him that group goals can be brought in line with the Army in general. Th first portion of this problem is to assure the assignment of a leader whose qualifications fulfill the needs of the group. Once the leader i established in the group, it is entirely necessary to be sure that he i given appropriate authority and recognition by higher authority so that his leader status is reinforced. It is then necessary to assure that his training and information about the policies, needs and practices of higher headquarters is continuously available to him and that he has a clear understanding of it. He must pass this information on to his group and the normal confusion can only be increased by a failure of understanding by the leader. The need for clear presentation of inform ation to the group is particularly important in combat if subsequent bitterness, confusion, and ineffectiveness are to be minimized.

In the matter of group control during the periods of combat, a very interesting and simple procedure was developed in the Italian Theater during World War II. It was based upon the well validated assumption th there was a normal and relatively constant ratio between the number of wounded and the number of psychiatric (NP) casualties. While the number and rate per thousand of wounded (WIA) and NP varied directly with the intensity of the fighting, the formula NP/WIA x 100 = N% gave a result which was usually in the region of 20%. When this figure varied much in either direction, but generally upward, it almost inevitably indicate trouble of some sort in the unit concerned. Usually investigation of this unit disclosed that there was a markedly lowered morale, defective leadership, artificially altered evacuation policies, ineffective medical screening, or some similar problem. While this ratio did not disclose

the source of the trouble by itself, it acted as an almost unerring indicator of trouble in the unit. Since these figures were collected daily by battalions and were compiled and submitted to the divisional commander, through the surgeon, every two weeks, they formed an effective and continuous trouble indicator for units in combat. This procedure could usefully be adopted by all units in combat. In addition, interviews with a large number of psychiatric patients and with a number of line officers give some basis to the hypothesis that this ratio measures the psychological status of the unit and that this in turn is directly related to the combat efficiency of that unit. Although this hypothesis would require further validation before it could be accepted as a measure of combat efficiency, there are a number of related observations which make it probable that this assumption is at least approximately correct. Certainly it should be the subject of further research.

Recommendations

1. There is an urgent need for research in the field of group organisation, group dynamics, and group controls in the military services. This could be undertaken in the Army and should be based on the continuous study of a battalion through the period of organisation, training, and some months of combat. The investigation should be conducted by a multidiscipline team composed of a social scientist, psychologist, and a psychoanalytically oriented psychiatrist at a minimum. The data obtained would be useful to the military, industry, and other civilian groups as well.

2. Research should be undertaken to develop an instrument capable of indicating the combat efficiency of a unit. Past investigations have indicated that a continuous NP/WIA ratio, or some modification of it, may be such a method. Validation of this concept should be undertaken by the Army.

c. The NP/WIA ratio should be adopted by the Army as a routine method of indicating trouble in combat units.

3. Combat Leadership

In addition to tactical, administrative, and disciplinary activit.. a major and over-riding demand upon the combat commander is that of lead ship. Competent leadership is of importance at all times in the Army, b it is a paramount need for troops in combat. Not only is their health and well being concerned but their lives and safety are at stake as well Much has been written about leadership and the requisites of lea erhip much of that which has been written is impressionistic, not based on fac observation of a controlled nature. In spite of the importance of th subject, there has been an amazingly small amount of competant research in the field, and only a small number of investigations were undertaken in the military services in World War II. Among the most interesting of these were those undertaken by the British War Office Selection Board (1 some related studies by the Office of Strategic Services (18), and studie of attitudes and opinions of combat infantrymen about their officers (14) Only the last of these throws any direct light on the requirements of les ship in combat.

Some of the material from this survey indicated that the following combat officer characteristics were considered of importance by the combe infantryman from a veteran division.

Led by example, personal courage and coolness	31%
Encouraged men, gave pep talks, joked, passed on information	26%
Showed active co ncern for safety and welfare of men	23%
Showed informal friendly attitude	5%
Other	15%

Similarly, a group of combat veterans were asked to give the outstanding characteristics of the best combat soldier they knew. These attributes are given below and are classified according to whether this best combat soldier was an enlisted man, non-commissioned officer, or officer: (14)

	E.M.	N.C.O.	Officers
Courage and Aggressiveness	59%	42%	30%
Knowledge and Performance	28%	19%	13%
Leadership Ability	8%	33%	56%
Other	5%	6%	1%

It is apparent from these studies that courage and leadership ability are the prime requirements for the leader in combat whether he is an officer or non-commissioned officer. The leadership requirements are somewhat higher for the officer than for the N.C.O., and they place a heavy stress on leading by example and interest in their men, both in the form of encouragement, and interest in their welfare and safety. In essence the leader in combat is required to have a paternal attitude and courage, just as we might expect from consideration of the fact that the leader has, in group identification, the father of childhood recollection as his prototype.

In combat areas the junior officers and non-commissioned officers are the only leaders having direct and personal contact with the combat infantryman, and consequently their influence and effect is immediately and powerfully felt by the soldier. Although unavoidable, it is extremely unfortunate that the casualty rate is so high among these section and platoon leaders. The casualty rate among platoon leaders (second lieutenants) is the highest of any group in the infantry, for example, one platoon in Italy lost seven different platoon commanders in the course of

one month of combat. All too often the replacement leader has had little or no combat experience and his prestige, particularly in experienced units, is usually minimal. The effects of this on the group of which he is the nominal leader are self-evident. During the last war this problem was surmounted to some extent by battlefield promotion, although very frequently the man was sent to the rear for training as soon as he was commissioned and thus much of the benefit of his advancement was lost to his unit. It is difficult to know how to overcome this problem. It may be that the solution lies in not replacing the platoon leader while the platoon is in active combat but to designate the senior non-com as acting platoon leader until the platoon can be withdrawn. As soon as the platoon is withdrawn, the platoon leader can be replaced and the platoon allowed four to seven days to rest and re-integrate before being committed to combat again. Because of the great importance of the leader, this or similar remedies should certainly be studied under controlled circumstances.

The importance of the leader, and of good leadership to the group was often strikingly illustrated during the war by the minor epidemics of psychiatric casualties from small units, such as the section or platoon when that leader became a casualty (10). This was particularly noticeable when the leader himself became a psychiatric casualty, and in these instances the casualty epidemic among his men usually preceded the evacuation of the lieutenant by several days.

The senior officers of field grade and higher are usually rather dim figures to the combat infantryman. He seldom sees them, even more rarely talks to them and not infrequently he does not even know the name of his regimental, division, or even battalion commander. While this has little direct emotional impact on the infantryman, it does tend to produce

profound effects on the senior commanders whose policy decisions affect thousands of soldiers. All too often the senior officers, without being aware of it, tend to drift into a neglect of matters which affect the health and morale of their troops they are overconcerned with factors of material and tactics. Much of this difficulty can be avoided by establishing frequent personal contact with the smaller units and requiring the small unit officers to report on morale problems as regularly as they do on supply and tactical situations. The morale problems cannot be evaded if combat efficiency is to be maintained.

One of the major problems of leadership has been the appropriate training of the leader. A great amount of time is spent in training in administrative, supply, and tactical procedures, and while these are of obvious importance, the factors which effect the emotional well-being, morale, and motivation of the soldier are of equal importance. Although there is an increasing recognition of this, little has been done to correct the deficiency. For example, the Infantry Field Manual on the Rifle Battalion devotes only five pages to the individual and group needs, morale, and leadership, whereas it gives the other 336 pages to supply, organization, and tactics; and recently courses given at twelve different training schools for officers included only seven hours on subjects such as psychiatry, psychology of leadership, etc. One of the urgent needs of the Army is more intensive training of its leaders in the fields of individual and group psychology. These courses need not do more than give some rudimentary understanding of the fundamentals involved, but they should be followed by constant training in the application of this knowledge in the field.

F. Combat Fear, Anxiety, and Fatigue

In discussing fear and anxiety in combat it will be of some assistance to differentiate between the two even though there are some individuals who insist that such differentiation has little validity. In the following paragraphs, fear will be taken to mean the emotional and physical responses to danger from reality sources, whereas anxiety will be taken to mean the emotional and physical responses which are elicited by inappropriate stimuli, either real or phantasied. While the reactions of fear tend to disappear with the removal of the initiating stimulus, the reactions of anxiety often persist after the removal of the stimulus and are frequently reactivated by phantasy. The original sources of anxiety lie in the unconscious of the individual. Often fear and anxiety reinforce one another, and this is particularly true in combat.

The major source of fear in combat is the real danger of injury or death, and as a consequence almost all soldiers in combat are frightened part of the time. In Italy where the infantry had experienced prolonged combat, 74% of enlisted men reported that it became more frightening with time and an additional 18% stated that combat was frightening all the time (18). The relationship of this fear to fear of injury is indicated by the following responses to the question, "While you were in combat, did you ever have the feeling that it was just a matter of time until you would get hit?"

	Per cent giving each answer
Almost always felt that way	26%
Usually felt that way	13%
Sometimes felt that way	23%
Felt that way once in a while	21%
Practically never felt that way	15%
No answer	2%
	100%

That there was a real basis for these fears is clearly indicated by the following statistics from the European Theater. In the rifle companies of four divisions entering Normandy, 68.7% of the officers and 59.6% of the enlisted men had become battle casualties after eight weeks. Similarly a division in Italy during the break-out from the Anzio beachhead had a battle casualty rate of 4,850 per 1000 per annum over a ten day period; this same division during the campaigns in Sicily, Italy, Southern France and Germany had approximately 39,000 casualties against a nominal daily strength of 14,000. The 100th Battalion (Sep.) on an initial strength of 997 had been awarded more than 1000 Purple Hearts in less than three months. It is a small wonder that the infantryman has a realistic fear of combat.

Since most men are frightened in combat, and since the Army not only permitted but even encouraged a frank recognition of fear (20), the problem arose of how to separate transient fear reactions from psychiatric disabilities since the objective manifestations of the two were very similar. The solution of this problem was essentially quite simple in the combat unit. Those in whom the symptoms persisted after removal of the stimulus were treated as psychiatric casualties, and those who recovered rapidly after cessation of frightening stimuli were considered to be fear reactions. Thus was a rough diagnostic decision made by the non-psychiatrist at the level of the Battalion Aid Station. With increased experience, the psychiatric acumen of the Battalion Surgeon was increased and separation was made on a more sound technical basis. The line officer used the criteria of persistence of symptoms and willingness to try in spite of symptoms to separate fear reactions and psychiatric disabilities from the shirker. This also worked well as a rule-of-thumb procedure.

From a technical standpoint, fear of injury and death is not the only source of emotional breakdown. Each individual has a greater or

lesser load of anxiety which stems from unconscious conflictual sources going far back into childhood, and his ability to withstand the tremend threats of combat is dependant to a large extent on the amount of anxie in his makeup. If the amount of anxiety is great he will be able to tolerate only minimal combat stress before becoming emotionally incapacitated for combat; if his load of anxiety is small, he will be able to tolerate combat stresses for a relatively long period. But the adage "every man has his breaking point" is probably true. In addition to ... of injury, anxiety may be tremendously increased for the person with st unconscious hostility by the sight of injury to others. Similarly, dir blood, mountains, closed spaces, sexual deprivation, etc., may act as specific excitants which produce anxiety of a disabling degree in certa individuals. Theoretically it should be possible to screen out these i iduals before they reach combat, but in practice there are many reasons why this can be done only to a minor degree. Not the least of these re is the lack of any reliable screening method and the lack of criteria of what to screen.

One of the common phenomena of combat is fatigue. This is brought about by the intense emotional strain, deficient caloric intake, loss of sleep, strenuous physical exertion, unfavorable climatic conditions, and so on. The effect of fatigue is to decrease the efficiency of the indi idual, increase his emotional reactivity and increase the likelihood of emotional breakdown. Fatigue by itself does not and cannot produce neur its only action in this direction is to sensitize the individual so that the noxious emotional and physical stimuli in his environment produce mo disturbing effects on his rather precarious adjustment to combat than they would if he were rested.

A number of erroneous ideas have arisen about the relationship of fatigue and neurosis. This is in part due to the fact that a number of non-technical terms of this type were coined during the war for the specific purpose of having a term which was at once non-frightening and also carried the connotation of early recovery. It was designed to be used only on the Field Medical Tag and never as a true medical diagnosis It was first used (in the Army) in Tunisia in the spring of 1943, and its use was officially authorized by a II Corps order. Since its origin as the single word "Exhaustion" a number of synonyms have been used for this same purpose. Among these are "Fatigue," "Combat Fatigue," "Combat Exhaustion," "Battle Fatigue," and others, but all are only descriptive terms which have no place in diagnosis.

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ATTRACTING SPECIALIZED PERSONNEL INTO THE ARMED SERVICES

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Attracting Specialized Personnel into the Armed Services

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THE PROBLEM

This report is concerned with problems related to the attraction of highly specialized personnel for service in the armed forces during a period of national crisis. Its scope does not cover such vital coordinate problems as: (1) assuring an adequate supply of such personnel within the total available manpower; (2) drawing personnel into the armed services by non-voluntary methods; (3) assignment and re-assignment of personnel to specialized billets commensurate with their specialized skills; (4) maximal utilization of the skills and abilities of specialized personnel after assignment; (5) the employment of such specialized personnel as civilians for service with combat forces, in supporting activities in the military establishment, government, industry and civilian defense; (6) orderly withdrawal of such personnel from the civilian economy so as to assure the health, welfare, and productiveness of the nation. In short, this report is confined to the problems of inducing specialized personnel to offer their services voluntarily.

As used in this study, the term specialized personnel is meant to include all persons, who by thorough training and appropriate experience have acquired knowledge and skills which make them competent in a recognized profession or a highly complex activity in which able people cannot be trained in a short, intensive course. In the broad sense, specialized personnel would include physicians, nurses, scientists, engineers, and also railway traffic managers, river pilots, draftsmen, machinists and arctic explorers. Highly specialized personnel represents those who have been admitted to full practice of a recognized profession, requiring education from at least the level of

the bachelor's degree through to the professional degree such as M.D. or D.D.S. or the Ph.D. degree in the sciences.

This paper will concern itself with the higher levels of specialized personnel, all of whom would be presumed to be eligible for commissions in the military forces. It is recognized that there is a distinct problem concerning the sub-professional level of specialized personnel including such highly important groups as electronic technicians, model builders, demolition experts, ordnance technicians, aviation mechanics, laboratory technicians. These specialties more usually carry non-commissioned officer ratings in the armed forces. The day-by-day operation of military units are directly dependent upon this group of technicians. Their vital importance merits a separate study and report on the subject of acquisition and retention of such personnel for the armed services.

Voluntary attraction of specialized personnel into the armed services presents a number of inter-related problems, some short range, some long range, and a number of personal considerations such as economic and professional factors, family responsibilities, obligations to present affiliations, and patriotic motives. All of these are variables that must be resolved with the changing mass psychology and tempo of the times, and with the evolving laws and regulations which will be set up to insure the national interest.

Highly specialized personnel are similar in many respects to any other group of persons needed in the armed services. They are, as a group, no more and no less willing to serve where needed, no more and no less deserving of special privileges, and as individuals no more entitled to special consideration. Because of the high importance of their skills both in the stability and productiveness of the civilian economy and in the striking power and efficacy of military forces, and the relative scarcity of persons possessing these skills, individuals who meet these qualifications must be considered as a strategic

resource, to be utilised as effectively and efficiently as possible. Furthermore, because such highly specialised personnel compose such a small proportion of the armed services, because they are dispersed so widely throughout the services, and because they are almost always in a staff rather than a line duty, their special problems rarely come to the attention of field commanders who must give highest priority to problems of line command. They and their needs are likely to be overlooked, thus impairing the quality of the service they can render and the contribution their skills can make to the overall efficiency of the military force of which they are a part.

This problem has not gone unnoticed in the military services. In World War I recognition was given to the need for specialized personnel beyond that already represented in the medical, engineering and signal corps, with the establishment of sanitation officers whose duty included the assurance of adequate water supply for troops, with the use of civilian scientists as consultants in developing improved offensive and defensive measures in fields such as submarine warfare, chemical warfare, transportation and improved communications.

The many scientific and technological developments employed in World War II greatly accelerated this trend, and forged a new pattern of effective cooperation between civilian scientists and military leaders. The need for scientists to serve military needs multiplied so rapidly that the methods of acquisition and assignment were on an emergency and expediency basis. Somehow the needs were met. But it was fortunate that our enemies did not mobilise their scientific potential until late in the war when their intuititive methods were no longer successful. Many of the problems created by attempting to utilise our scientific resources in the military effort without adequate pre-planning are now being studied. But many scientists who served in uniform remember their misassignments, their poor utilization, their disillusionments. These memories

on the part of scientists will make them more hesitant in volunteering their services again. To this extent the problem of attracting scientific and technical personnel to the armed forces is made more difficult today. On the other side it is to the credit of the military leaders that they have recognised these difficulties and are now taking aggressive measures to avoid a repetition of them. To that extent the problem is much more hopeful of satisfactory solution.

IN SUMMARY

Basically, the problem of attracting specialized personnel to voluntary service in the armed forces is the problem of making the services attractive to them.

This objective can be achieved in part by establishing closer working relationships with the professional societies of specialized personnel, and drawing upon them for advice and assistance in planning, policy making, procedure development, and operating activities.

To facilitate liaison with professional societies, and to interpret needs and influence practices affecting specialized personnel in the military services, advisers on specialized personnel should be established in appropriate places within the military establishment and in the policy making agencies of the federal government.

Directors of specialized personnel are needed within the National Military Establishment in order to coordinate and integrate the recruiting, provision for, and utilization of such personnel. These directors would work with and through the established channels of present organizational lines, and should be organizationally placed to insure consideration of their recommendations, and compliance with approved practices.

Environmental factors conducive to good professional and specialized work must be provided within the military services as a pre-requisite to attracting professional and specialized personnel to voluntary service.

Rosters of specialized personnel initiated by the National Military Establishment or by the Manpower Agencies, and the assistance of the professional societies, are essential in ascertaining personnel resources and identifying individuals needed for specialized service. Arrangements should be facilitated for their full utilization.

The Military Services need to improve their record of utilization of specialized and professional personnel in World War II. New and Improved methods need to be developed to assure this outcome.

Recruiting of specialized personnel must be on a personalized basis, in which the individual is sought because his special skill is known and needed. Mass methods are likely to be singularly ineffective.

Physical standards and age limits should be relaxed for certain types of specialized personnel and service to enable older men or slightly limiting deficiencies to pass. This would allow many former reserve officers to come back into the service for technical duties.

Further studies should be authorized to furnish more detailed information and to develop more detailed plans and programs.

The Manpower Pools from which Specialized Personnel must be drawn.

There are several manpower pools from which specialized personnel may be drawn. Each presents a somewhat different set of circumstances. These differences should be considered in planning the most appealing attractions for each group.

The Draft - Vulnerable Pool

This group is more important as a potential for future supply than as a present resource. Because of their more extensive period of formal education, and their professional experience following such training, most of this country's present supply of higher level specialized personnel are beyond the 18 to 26-year-olds from which the mass of Selective Service inductions will come. Subsequent legislation will affect the nature and numbers to be drawn from this pool. If young men are called for service at 18 or 19 years of age, and are to remain in the service for two years or more, practically none of them will have progressed far enough with professional training to qualify as "specialized personnel " before being inducted. Most of those who will complete their service before completing minimum professional training will have reached their 24th or 25th birthday, while those who go beyond the bachleor's degree will be proportionately older before they can be regarded as specialized personnel. Considering the long view ahead, and that is the reasonable view to take, this draft-vulnerable pool includes practically the entire future supply of specialized personnel. Physically unacceptable males, and the female population in this age group represent the only exceptions. It is this future supply, and the problem of avoiding a serious gap in the oncoming supply that points up the importance of a system of student deferment. The deferment problem is beyond the purview of this paper, but is mentioned as having a far reaching effect on future supply.

The Trained-at-government-expense Pool.

While relatively small in terms of total numbers or of a percentage of the total population, this group is a very important source of specialised personnel. There is little liklihood that this pool will be overlooked as a source of technically trained manpower. Legislation, rather than incentives, probably will be employed to draw from this pool. It should be added however that many young men trained at government expense during the war are volunteering for service as a sort of personally recognised obligation or debt of gratitude.

The Subject-to-recall Pool

Many technically trained specialised personnel served in the armed services as officers or enlisted personnel, and are subject to recall to active service. This pool includes practically all physically fit, not over-age men who served as naval officers during World War II; all officers and enlisted personnel in all services who have continued in some form of active or organised reserve; and smaller specialised groups such as the commissioned officers of the Public Health Service who become part of the military establishment in time of actual war or national emergency.

This is a very important pool as far as specialised personnel is concerned. In the first place it includes almost all of the men who served as specialised personnel in uniform in the more responsible ranks. These numbers are reduced by those who have been dropped because of age, physical deficiencies or by shrunken quotas in ranks too high to be retained in reserve components.

This pool can be sub-divided into two principal categories; those who were commissioned directly from civilian life; and those who went through reserve officer training programs. The latter are so important as a source of specialist personnel that they are treated as a separate pool in this report.

The R.O.T.C. Pool

Many, although not all, of those who qualified for military service by training in the Reserve Officer Training Corps are subject to recall to active duty. First, there is the younger group now enrolled in R.O.T.C. units in educational institutions. They are subject to call, rather than recall to active service, and as such may be regarded as a part of the present and future military forces. Second, there is the somewhat older group, no longer enrolled as students in educational institutions but who are still subject to call for active service. Third, there is the still older group who have allowed their commissions to lapse. This last group includes many whose military and civilian experience would make them highly valuable for specialized billets in the services, and many of whom could be attracted back into the service in time of national need.

The R.O.T.C. pool is rich in specialized personnel. This is partly due to the Morrill Act, signed by President Lincoln in 1862, which established the "Land-Grant Colleges" of which there are now more than 70 in the various states and territories. The "Land-Grant Act" provided for the establishment in each state of agricultural and mechanical colleges which would teach the practical arts, not excluding military science and tactics. These colleges became the principal state institutions of engineering, and technology, and all of them required basic military training of their students. Consequently these institutions became the focal centers for R.O.T.C. units, which together with N.R.O.T.C. units have spread to non-land-grant public and private institutions of higher education.

While all physically fit male students were required to take two years of basic military training in the first two years of their land-grant college curriculum, whatever it may be, the two last years were elective for advanced

training in military science, leading to a commission in the reserve. In most of these colleges many students in technical curriculums completed R.O.T.C. training and received commissions as second lieutenants upon graduation. Some institutions such as Texas A. and M. College have had a tradition under which practically all male students aspired to commissions. Over the long course of the years these R.O.T.C. colleges trained and commissioned large numbers of young men in the reserve corps of the army.

Because these Land Grant colleges were technical institutions, the stude: trained in them were a large component of the national supply of specialized personnel. This has been an asset and a liability in supplying technically trained specialized personnel to the armed forces. It has been an asset in th it resulted in much larger numbers of such personnel becoming indoctrinated i. military affairs and qualified for the responsibilities of officers. It has been a liability in that many of the technical graduates have trained for and accepted commissions in the line services rather than in their technical fiel: This has resulted in the anomaly of young men specializing in a technical fie. for their civilian occupation, and training for a type of military service in which their technical training would not have an opportunity to function. That pattern was not incongruous in the earlier tradition when a civilian army laid aside its civilian occupations to take up hand weapons and serve directly on the field of battle. But today, increased emphasis should be given to fuller utilization in the military services of the technical skills developed for civilian pursuits.

The Draft-exempt Veteran Pool

This pool is composed principally of veterans who completed their period of service in the military forces, and are not now subject to recall as they would be if they were now in an organized reserve program. A very large numbe

of such veterans used their "GI" benefits to advance their education, and many of them, by completing programs of technical training now compose a very large reservoir of the younger age group of specialized personnel.

The Draft-exempt Non-veteran Pool

This pool includes a very important and moderately large reservoir of specialized personnel. The younger men in this pool, now in the full bloom of their productive careers, may have been of military age during World War II, but were never inducted into the armed services. Their continued civilian status may have been due to a number of different reasons, often to the distaste of the individual. Compulsory deferments because of high priority civilian work, dependents, inability to meet physical requirements because of minor or more serious handicaps, may have prevented their serving in uniform. Many of them served as civilians in military establishments, or in closely allied activities.

The older men in this pool, age 45 and beyond, represent some of the most thoroughly trained and widely experienced specialized personnel, whose skills kept industry and the civilian economy at peak efficiency. Their "know-how" is a resource of greatest value.

Many Specialized Personnel are Exempt from Compulsory Service

Specialized personnel in the pools described above divide into two broad categories: those for whom military service is mandatory; and those for whom such service is voluntary. The mandatory category covers the first three pools, and a portion of the fourth; the voluntary category includes the rest. The remainder of this report will be concerned with that portion of the nation's specialized manpower which must be attracted to military service rather than impressed into such service.

While this paper considers the attraction of specialized personnel to the military services, it is written with the full conviction that only a proportionate share of the nation's resources of such personnel should serve in the military forces. It is equally important that specialized personnel be equita distributed among the essential aspects of the total national economy, militar and civilian.

FACTORS AFFECTING VOLUNTARY SERVICE

Each individual recognises a number of different factors which he must weigh, one against another, to decide whether he should or should not enter the military service on a voluntary basis. While no two individuals would consider the problem in exactly the same way, it is most probable that each would give some consideration to the impact of military service upon his personal life, his professional future, and his economic security. Against this pattern of reasoned reactions he must reconcile his personal emotions and his patriotic drives.

The Personal and Family Factors

The man with a growing family will be hesitant to leave them or to inflict upon them the difficulties of moving with him from one after another inadequate living accomodations. A well organised program for providing suitable accomodations for the families of reserve officers, close to their stations, would go a long way to make service more attractive. This is an obligation that should be recognised and provided for in the military establishment. In lieu of residence quarters for his family, the officer who does not have his family with him should have compensatory leave in liberal amounts at reasonable intervals. This policy, coupled with provision for fast, dependable and economical transportation, such as may be provided by free passage on Military Air Transport planes, or reduced fares for service personnel on public carriers would remove one formidable deterrent to voluntary service. Facilities of these kinds should be provided by the military services, but it would be preferable if the assignment and utilisation of the facilities would be administered by a non-military organisation such as the American Red Cross. Whatever organisation may be given this responsibility should be dedicated to serving the human needs of military

personnel, without consideration of rank or status. The services provided for enlisted personnel certainly should not be lessened. But it should be recognized that officers have human needs too, and such services should be equally available to them.

Numerous little services and conveniences have a very strong cumulative effect upon the attitude of the civilian specialist toward military service. Opportunity for his family to shop at post exchanges or ship's stores, access the recreational, social and even the mess facilities of the military base, ... availibility of the medical and dental services, including hospital facilities are important to him and to his family. In many situations it would be necess for the military establishment to provide arrangements for good schools for the children of resident military personnel. This may vary from the expedient of special transportation, to the extreme of providing the entire school plant equipment, and teaching staff. This is particularly important, even when local schools are available if those schools do not meet the standards of better schools in other states or communities. Specialized personnel are usually deeply conscious of the value of good schooling and hence are most concerned about the quality of the schooling available to their children.

There are additional sociological considerations too. Military personnel and their families are not always welcomed into the social groups and institut of the community in which the military base is located. This is a serious obstacle in itself, and appropriate effort should be made by leaders on both s of the fence around the military reservation to understand, appreciate and extend courtesies and friendliness to their neighbors. Whether such on and off-reservation rapport is established, it behooves the military establishment to do everything possible to create a friendly and happy community for and among the military personnel and their families at the base. As far as the

families are concerned, their community life should be conspicuously free of the privileges and priorities usually associated with military rank.

Such matters as these may seem to be of little moment. They are not. Specialized personnel are more likely than any other group in the population to be intolerant of and antagonistic to the slightest evidence of special privilege accorded anyone other than themselves. The solution seems to have been worked out most harmoniously where there is equality of opportunity for all. Larger residences should be assigned to personnel with larger families, rather than to officers of higher rank. This is one example of a personnel policy which can assist in creating a favorable social environment. It also would avoid the caste system of residence sections assigned exclusively to higher ranking personnel. Evidence of the unfavorable attitude toward priviledged housing are terms such as "snob-hill " used in referring to areas restricted to higher rank.

There is too little space to consider this aspect in more detail in this report. It is hoped that more adequate study will be made, and policies put into force that will maximise environmental conditions that are attractive to all, including specialised personnel.

The Professional Factor

Most specialised personnel are engaged in professional work, which imposes very severe demands for continuous study and training. Any serious interruption of the opportunity to grow in professional knowledge, skill, judgment and reputation is disastrous to the professional future of the individual. The fields of science and technology advance so fast that any breach in the continuous process of education soon relegates the indivudual to a lower level of professional standing and value. This is most acute among research and development workers, and of lesser but far from insignificant importance among

practitioners in the various fields of technology such as medicine, psychology and engineering.

Opportunity for Advanced Training

Provision can often be made for the continued growth of professional personnel in the military services. Formal programs of instruction, offered at the base or at a nearby center, and sponsored by a recognized institution of higher education have proven to be a strong attraction to the more able and ambitious younger men who are striving for graduate degrees. In-service courses also preferably sponsored by a university and taught by university staff members or by senior staff members of the technical departments of the installation rank next in attractiveness. These in-service courses should provide academic credit, if possible, but if that cannot be arranged, non-credit courses are worth many times their cost. Many military installations have demonstrated the value of such programs.

Assignment to stations for long enough periods of continuous service to complete periods of instruction, resident study, internship and other programs of formal or informal study will help.

More mature specialized personnel who have attained full stature in their professional training will welcome the opportunity to take such courses for refresher purposes, to delve into new branches of their field of knowledge, to keep abreast of new theories and new developments, to explore fields of knowledge denied to them in their earlier training, to specialize, and for other purposes of importance to them. Mature, professionally recognized specialists welcome an opportunity to teach courses of this type to others who are climbing the same professional ladder.

Opportunity to work at centers which are well equipped for study in their field of interest, or to gain experience normally out of reach, are other

powerful incentives. The military services have many such opportunities. They should be made known to specialized personnel and arrangements made to commission and assign key people to pre-arranged billets.

Other opportunities exist in the technical services to assign specialized personnel to places where they can get highly desired experience. Surgery is one example. Jet propulsion, radar, cosmic rays, meteorology, oceanography, fluid dynamics, nuclear reactions, stress analysis, anti-biotics, cryogenics, computer mathematics, photogrammetry, are only a few of hundreds of other specialties in which study facilities and opportunities for experience are unexcelled in the military establishment. These are attractions that can be exploited as inducements to accept military billets.

Another important inducement to specialized personnel is the opportunity to work in close association with recognized leaders in their field. If recruiting of highest level personnel is successful, it will simplify the problem of getting other specialized personnel to accept commissions to work with them.

Compensation for Interrupted Professional Careers

On the negative side is the matter of interrupted professional careers. This is acute at two levels, first at the student level, while one is receiving his basic professional training; and even more seriously, the second, when specialized and professional personnel are in the prime of their careers. Because this discussion is pointed to obtaining personnel who are not subject to selective service or subject to recall to active duty, the second group is the more important.

Many professional workers are engaged in their own private practice. It takes years to build up such a practice. Leaving it, even for the most patriotic reasons calls for a sacrifice far out of propotion to what others make to

enter the service. Moreover, the type of practitioner needed in the service is almost equally needed in a continuation of his civilian practice.

This problem is exceedingly complex and difficult of equitable solution. It needs careful study. A committee chosen to include representatives of the professional fields, the military services, and civilian manpower requirements could offer constructive advice. Such matters as "re-establishment compensation providing a year or more of continued pay in the attained rank should be considered.

"Practice Maintenance" provisions would also go a long way in clearing obstacles to service. These would have to be worked out at the local level by a committee of civilian practitioners organized on smaller geographic divisions such as cities, counties, or congressional districts for the more numerous professional groups, at the state level for the less numerous professional groups. "Practice maintenance" provisions should include but not be restricted to other trained and resident workers taking over the practice of the professional worker in the service, but probably should provide for continued office maintenance and even contribute to the earnings from the practice. The latter may be done on a guaranteed minimum, an income tax exemption, or some other appropriate means.

For those professional workers who are employed by a private or public organization or institution, a "practice equivalence" adjustment in compensation could be provided. It may seem that professional workers in this type of employment do not lose anything if their re-employment rights are protected. As a general rule, however, they lose the advancement opportunities that their stay-at-home colleagues enjoy who remain in their positions. During periods of accelerated activity, characteristic of a war economy, these advancement

opportunities are very substantial, and much more frequent than in normal periods.

While these suggestions offer financial recompense, their prime purpose should be to keep an established practice intact as far as that is feasible, so that the process of re-establishment may be reduced in its magnitude.

The Economic Factor

Both immediate and long range or future economic advantages are important to specialized personnel. Those who may choose whether they will serve in uniform are going to be in urgent need as civilians in essential war work. Their civilian earnings will be high - far higher than can be matched in the armed forces, unless some premium is paid over and above the regular emoluments of their rank. A system or schedule for premium pay, in some form, should be considered in all specialized fields.

Fortunately, some of the difference between military pay and civilian earnings can be offset by the strong incentives of many specialists to do their individual duty by military service. It is easy to persuade oneself of one's patriotic contribution to the war effort in a highly essential civilian job, particularly in a well paid civilian job. And such jobs are likely to be well paid.

Future economic advantage - if there is real prospect of it - may also compensate for lower immediate financial return. During their long period of advanced education, specialized personnel have had to look to the future for their increased earnings. If the services can make it possible to grow in professional standing, training and reputation - as by advanced educational opportunities - lower immediate earnings would be considered more philosophically.

General Deterents to Voluntary Service

In addition to the factors previously discussed, there are some general conditions, beliefs, and attitudes that exert a very potent negative effect on voluntary service of specialized personnel. One of the most serious of these is the armed services' reputation for poor utilization of specialized skills of office and enlisted personnel. Next in probable importance, and related to the first, is the system of placing specialized personnel under the command of non-technical officers.

These problems are so serious that they may force the alternative of complete and universal national service, unless immediately corrected. Studi in the armed forces and comments of representatives of professional societies underscore this problem.

Whenever an activity includes two or more functions which call for highl different specialized training, skill and experience, there is potential confl between diverse views, methods and personnel involved. One person must be responsible for the coordination and administration of the activity, with authority to act, or chaos results. That person should be competent to act in the dominant area of his responsibility, relying upon staff or line assistants to direct the more highly specialized activities that contribute t the mission of the organization.

If it is primarily a military activity, a military man should lead it; i primarily a non-military, technical activity, then a technical man should lea If it is both military and technical, in about equal measure, the ideal leade would be about equally competent in both fields, but this is usually impossib

It is difficult to overcome some of the disadvantages of placing a milit officer in charge of a technical operation in which the officer is not techni competent. But it is certainly possible to adopt a policy which alleviates

rather than accentuates difficulties arising from non-technical command.

One successful practice is to have a relatively permanently assigned deputy who is primarily a technical expert, with this officer in charge of all technical aspects of the installation or activity. The commanding officer will have other executive assistants who will carry out the non-technical operations of the installation. Responsibility for the accomplishment of the mission of the installation, carrying out orders from higher echelons, coordination of activities with those of other installations, and within his installation, the coordination of non-technical services with the technical services, or vice versa if the mission of the installation or activity is non-technical, will be the direct responsibility of the officer-in-charge.

It must be recognized that within the military establishment, command must be vested in military officers. Above the command, civilian control is represented in the president and his cabinet officials. Above the command, too, is civilian policy formulation, represented by the congress and the laws and boards or commission it has created to reflect its will. Below the command may be cadres of specialized personnel either military or civilian, or both.

One approach is to invite the professional societies to work with the responsible organizations in the national government in formulating plans for correcting these conditions. Among the aspects that should be considered are these:

1. Establishment of special boards for each professional group at both the national and state levels, in cooperation with the professional societies.
2. Entrustment to these national boards recommendation for policies, standards and procedures to govern the selection, induction, rank, compensation, assignment, training, evaluation,

promotion, review, reassignment, and demobilization practices.

3. Provision for representatives of these boards to be civilian advisers to the commanding officers of the technical services.
4. Placement of responsibility within the technical services for execution of all policies and standards, the development of career plans for individual officers, and the issuance of orders affecting the assignment, promotion, transfer and similar matters pertaining to such officers.
5. Establishment of an Evaluation and Utilization Branch within each technical service, to which each special officer submits required reports at least semi-annually on the utilization of his own special qualifications; with some tie-in with the National Professional Board represented, such as review of reports and subsequent action taken.

Uncertainty of Period of Service

In many occupations "the duration" of an emergency indicates the duration of the change in the occupational and economic opportunities. Not so for the highly specialized occupations in most demand for military purposes.

The physician or dentist who leaves his practice and the engineer or physicist or chemist or bacteriologist who leaves his position in an organization which will have increased demands created by a national emergency, knows that the longer he is away the less will be left for him when he returns. A fixed period of service, rather than "for the duration" would go a long way to make voluntary service more attractive to men in such positions. It would

be worth considering a fixed period of active service, perhaps two years - or even one year, for those personnel who are in occupations vital to both the military and the civilian economy, and which require long pre-induction training short post induction training, and whose place in the essential civilian economy would seriously deteriorate by prolonged absence.

Another provision which should be considered is a greater fluidity of inter-change of individual specialized personnel between the various military services, and back and forth between civilian and military status. Such fluidity, properly supervised, could reduce acute shortages in one place while unutilized personnel are hoarded in another.

Husbanding of Human Resources

Tangible evidence, backed up by a system in which the people would have confidence, of drawing into the service only those needed in the service, and full use of skills of those already in the service would go a long way to spur voluntary service.

One criticism of the military services is that they don't know, and don't care, whether they already have specialized personnel of the type they seek. Classification systems for officer and enlisted personnel have been developed and much could be done with this information at present to fill billets from within the services. The military personnel classification and assignment systems must be closely articulated to the changing demands of the services. The criticism of the military establishment is not that the system is lacking but that it is insufficiently and inadequately used.

Another criticism of the military services is that they are not concerned about the needs of the civilian economy and the disruption caused by withdrawal of specialized personnel from civilian pursuits. One aspect of this problem is the assessment of our total national supply of specialized

personnel and the quota of them needed in essential civilian work in order to support an all-out war economy.

Auspicious beginnings have been made in these directions. Mobilization needs of industry have been under study for some years. The National Roster of Scientific and Specialized Personnel of World War II has been preserved in a dormant state and would yield some valuable, but incomplete and not up-to-date information. More recent rosters have been developed as joint projects of the Army-Navy-Air Force with the professional societies and the Department of Labor. These are the Source File of Scientific Personnel with about 50,000 detailed biographies, on punched cards; and the Survey of Selected Engineering Personnel with about twice as many biographies. Both were designed for usefulness in a national emergency and premeditated the type of information needed for military planning and identification of personnel with special qualifications. Other rosters have been accumulated as special projects of certain professional societies.

Disgruntled individuals, and there are many who had cause to be, have been vocal and influencial in shaping popular opinion about the shortcomings of the military establishment in particular, and other government agencies in general, in adequate utilization of specialized personnel.

More progress has been made within the post-war period than is generally known. But still more progress needs to be made. As such advances are made the military establishment should be more vocal in reporting and interpreting them to the public. In addition and better yet as far as specialized personnel are concerned, the professional societies should be brought into closer participation in the planning as well as the execution stages of new approach and the administration of tried and proven practices. Through the journals of these professional societies can and will be built a greater confidence that

adequate plans are being made.

There still remains the all important public opinion problem, always vital in democratic action. The public is skeptical that the military services will use all the expensive classification, roster, and assignment mechanisms available to them. Cooperative planning, design of standard operating practices, and meticulous care in using specialized personnel in specialized assignments, will furnish the material on which a constructive and active public program can be built.

Recommendations for Implementing

Getting specialized personnel into the military services is closely related to getting the most out of them in the services. Both are contingent upon recognition that what is needed are not special privileges for individuals but special provisions for their work. Physical facilities and equipment have been provided without stint. Supplies and supporting services are more frequently encumbered with involved procedures and wasteful delays. Human needs are a different matter. Organization charts and manning tables call for ample numbers. Facilities for the physical needs of personnel are generally satisfactory. But provision for the intellectual, social, personal and family needs are usually severely limited, and the cumulative effect of these are intensified by needless petty annoyances, inconveniences, and irritations.

Constructive and imaginative personnel administration must be provided at all levels, recognizing the total environment and all of the human problems involved. Too frequently, at the operating level personnel administration has been entrusted to officers of junior rank and their duties have consisted mainly of clerical chores. As in civilian organizations, the military services should recognize that good personnel administration is an important and complex

responsibility, deserving of the full-time attention of high ranking, specially qualified officers.

Specialized personnel need a voice in high places. Some have, others do not. For example, medical officers are commissioned in a specialized corps and are under the jurisdiction of that technical service. Physicists, psychologists, mathematicians and many engineers are among those specialists who have no technical service primarily concerned with their work. The personnel problems of such specialists require specialized attention in training, assignment, utilization, transfer, promotion, and even recruiting. These special problems need special representation both at policy and at operating levels.

An Adviser on Specialized Personnel should be on the White House staff to consult on policies affecting the service of professional and specialized personnel in all parts of the national economy. Special advisers on professional personnel should be appointed in each major department and service where they are vital to the work of the organization.

Within the National Military Establishment there should be, in addition to an adviser on specialized personnel in the Personnel Policy Board, a Director of Specialized Personnel who would operate at a high level in the Office of the Secretary of Defense. This director should be charged with the responsibility of integrating and coordinating the policies and practices of the various military departments and technical services in their management of specialized personnel. In each military department there should be a similar director of specialized personnel to provide for the required operating functions. Such directors and their supporting staffs would be particularly valuable in periods of mobilization planning, actual mobilization, recruiting, training, utilization, inter-change of personnel, and demobilization.

Continuous evaluation of the utilization of specialized personnel is another need in the military services. The advisors and directors of specialized personnel should participate in plans and review of this function.

Selection and recruiting of specialized personnel is another special need in which these advisers and directors can participate.

In all matters affecting professional and specialized personnel a close working relationship needs to be established with the professional societies. These societies should be consulted and represented in matters of policy, plans and procedures, and their facilities should be drawn upon for roster and recruiting purposes.

Recruiting of specialized personnel should be organized on a personalized basis. The best approach to such personnel is to seek them individually, for their own special talents, and because those talents are known and wanted in the service for which the recruiting contact is made. If key men are recruited, they will be effective in drawing others in to work with them.

Above all, to win and hold the confidence of specialized personnel, the services must demonstrate that they are serious in their need, are frugal and efficient in using those they have, recognize the balance that must be maintained between the civilian economy and the military requirements, and show a genuine readiness to respect the established standards and recognized practices of the professions whose members they seek.

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COMMUNITY FACTORS IN PROCUREMENT OF MILITARY PERSONNEL

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COMMUNITY FACTORS IN PROCUREMENT OF MILITARY PERSONNEL

I. Structural Factors Bearing upon Military Manpower Resources in the Community.

A. Age-sex composition.

The distribution of age in the United States, by sex, and by type of place of residence, is shown in Table 1. It is apparent that in urban places the population is concentrated in ages 15 to 45, which are also the militarily and economically most productive ages. By contrast, the rural farm area is deficient in the number of persons 15 to 45 years of age. The rural nonfarm population, a rapidly growing segment of the total population, occupies an intermediate position in respect to the proportion in the 15 to 45 year areas (rural nonfarm areas) comprise approximately four-fifths of the nation's population and are continuing to absorb a disproportionate share of the national increase, they constitute the principal reservoirs of manpower.

It may also be observed in Table 1 that women are more heavily concentrated in ages 15 to 45 in urban and in rural-nonfarm places than are men. Again the opposite situation obtains in the rural farm area. In fact, women outnumber men in cities and the disparity increases directly with size of city. The only important exception to this generalization is found in manufacturing cities, particularly where the manufacturing is of the "heavy industry" variety.

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I. Structural Factors Bearing upon Military Manpower Resources in the Community.

A. Age-sex composition.

The distribution of age in the United States, by sex, and by type of place of residence, is shown in Table 1. It is apparent that in urban places the population is concentrated in ages 15 to 45, which are also the militarily and economically most productive ages. By contrast, the rural farm area is deficient in the number of persons 15 to 45 years of age. The rural nonfarm population, a rapidly growing segment of the total population, occupies an intermediate position in respect to the proportion in the 15 to 45 year areas (rural nonfarm areas) comprise approximately four-fifths of the nation's population and are continuing to absorb a disproportionate share of the national increase, they constitute the principal reservoir of manpower.

It may also be observed in Table 1 that women are more heavily concentrated in ages 15 to 45 in urban and in rural-nonfarm places than are men. Again the opposite situation obtains in the rural farm area. In fact, women outnumber men in cities and the disparity increases directly with size of city. The only important exception to this generalization is found in manufacturing cities, particularly where the manufacturing is of the "heavy industry" variety.

The concentration of women in urban areas is a function of a deficiency of economic opportunities for women in rural areas, on the one hand, and an abundance of semi-skilled (domestic, light manufacturing, service, and clerical) and other opportunities for women in cities, on the other hand. In this connection, it should be noted that female migrants are primarily short-distance migrants. Women drain into cities, as it were, from the rural areas roundabout. Long distance moves involve men in much greater numbers than women.

TABLE 1

Percentage age distribution, by type of place of residence and by sex, United States, 1940.

Age	URBAN		RURAL NON-FARM		RURAL FARM	
	Male	Female	Male	Female	Male	Female
Total	100.0	100.0	100.0	100.0	100.0	100.0
Under 15	22.2	20.8	27.5	27.8	30.7	32.7
15-19	8.7	8.8	9.0	9.4	11.2	11.0
20-24	8.7	9.4	8.3	8.8	8.6	7.9
25-29	8.6	9.3	8.3	8.7	6.9	6.8
30-34	8.3	8.5	7.9	7.9	5.9	6.1
35-39	7.9	8.0	7.1	6.9	5.6	6.0
40-44	7.5	7.3	6.3	5.9	5.3	5.7
45 & over	27.9	27.9	25.6	24.6	25.8	23.8

Sixteenth Census of the United States, Population, Vol. II, Table 7. (Washington, D.C. Bureau of the Census, 1943).

The relative scarcity of military aged population in rural farm areas conceals an excess of population. In general, agriculture is both an overpopulated and an inefficiently organized industry. Mechanization and a withdrawal of subsidies would release large numbers of agricultural workers for other kinds of activities.

B. Industrial Composition.

A second structural feature of a community which affects the availability of its manpower for military service is the ratio of essential to non-essential industry. Presumably the working force of non-essential industry is available for military service, while that of essential industry is not available. This distinction between kinds of industry is not an easy one to make, however, as civilian experiences in the last war indicate. Production workers require a variety of services, some of which cater only to civilian morale.

A further qualification of the availability of the working forces of what may be called non-essential industries arises in respect to the fitness of such personnel for military service. For example, rejections of Selective Service registrants for failure to meet physical standards were 50 per cent, and higher for domestic service workers and other service workers during World War II.[1]

Given these considerations, the principal concentrations of non-essential industries are to be found in cities and in proportion to

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[1] C. H. Greve, "Physical Examinations of Selective Service Registrants During Wartime," Medical Statistics Bulletin No. 3. National Headquarters, Selective Service System, 1944, p. 12.

their size. Conversely, manufacturing and particularly heavy manufacturing is found mainly in the small and moderately sized cities located within the metropolitan areas of cities of 250,000 population and over. This pattern of distribution is a product of the well known deconcentration trend, a trend which was greatly stimulated by plant expansion policies of World War II.

While the greatest manpower pools are to be found in the largest cities, both because of the age compositions of their population and the frequencies of non-essential industries located in them, the volume of withdrawals that can be made from those pools without impairing the ability of such places to continue to carry on their essential activities may be quite limited. Unfortunately this is a matter about which comparatively little is known.

C. Availability of Alternative Labor Forces.

American culture being what it is, two large marginal labor forces exist within the population. These are called marginal because they are normally under employed and often inefficiently employed; in a sense, they move into and out of the labor force with changes in the level of employment. Reference is made to women and to Negroes.

Although women have been participating in the labor market in increasing numbers, especially since the beginning of World War II, it remains that only a small proportion are actively engaged in employment. And of those who are employed, most are engaged in non-essential industries.

Recent experiences have shown that they can move readily into manufacturing and other traditionally male employments.

Negroes, much more so than women, are a neglected and wasted manpower resource. Their skills and their abilities to acquire skills often pass unrecognized, even under conditions of national emergency. The competence of Negroes, given adequate training, to perform technical operations has been amply demonstrated. So also has their ability to work in close association with white employees.

Thus where women, particularly women between ages 18 and 30, and Negroes are present in large numbers, the community is capable of releasing without dislocation a larger proportion of its manpower for military service than would otherwise be possible.

D. Relevance of Civilian Skills for Military Needs.

Since the military establishment when fully manned constitutes a more or less complete economy, it necessarily utilizes a large assortment of the skills normally employed in the civilian economy. In a great number of instances, therefore, the transference should be direct and simple. A study of the Army Air Force by one author indicates the possibility of "almost perfect utilization" of civilian skills.[1] The same author found, however, that while one civilian skill was neglected in only two percent of the cases, another was neglected in 72 percent of the cases. This would seem to suggest that the relevance of civil skills for military purposes is contingent largely upon the adoption efficient manning procedures by the armed forces. Doubtlessly, there are many special problems of adapting civilian skills to unusual mili

1 Thomas W. Harrell, "Use of Civilian Skills in the Army Air Forces," Science (1947) 106, 26-28.

requirements which this contributor is unqualified to treat.

E. Facilities for Accommodating Substitute Labor Supply.

The induction into the armed forces of qualified men and women does not result in a corresponding amount of vacancies in housing and other facilities in the communities of departure. The family units from which inductees are removed in most instances continue as units with all of the consumer demands for space, shelter, and services that families generally require. The vacancies created by induction, in other words, are vacancies in a family organization rather than simply physical vacancies which strangers may fill. Thus the in-migration of a replacement labor force imposes demands for extensions of physical equipment including housing, sewer lines, power lines, transportation, etc. Sooner or later the increased burden is felt by the police and fire departments, the schools, and numerous other service agencies. Very few communities, however, have an appreciable amount of unused equipment and service facility. During World War II, abrupt population increases of as little as one percent in large cities, e.g., Philadelphia, created almost unmanageable demands on municipal facilities. In general, the expansion of facilities lags a year or more behind population increases, particularly in rapidly growing cities.

F. Adaptability of Group Organization to Loss of Members.

The adaptability of groups to losses of members constitutes a problem about which little is known. What proportion of its membership

may a group lose and still continue to operate as a group? How much turnover of membership may a group sustain without a serious disru.t of the rhythm of its functioning? To what extent are individuals in changeable parts in the role structure of a group? On these and man related questions there is scarcely any reliable knowledge. No doui the answers to such questions would vary for different kinds of grou Small, informal groups probably present a different problem than th which would be encountered in large, formal or institutionalized gro Perhaps different findings would result from studies of groups with divergent functional orientatic.s, e.g., civic groups and groups formed of the personnel of a factory or store.

It is known, however, that the removal of a husband and father from a family removes also a highly important role from the family structure.[1] While the family may effect an adjustment to the loss of the husband-father role, it is often an irreversible adjustment. The adjustment may consist, for example, of the wife taking on some of her husband's responsibilities and it may include eliminating or neglecting certain other functions, such as supervision of children. In a very real sense the family loses a part of its staff when the father is removed and it can no longer operate as the same kind of unit. Comparable effects probably occur in most other small, intima groups.

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[1] Cf. Adam Curle, "Transitional Communities and Social Reconnection," Human Relations, I (June 1947), 42-68 and (Nov. 1947), 240-04.

II. Influences of Group Attitudes on Individual Attitudes toward Military Service.

A. Traditional Attitudes.

Many communities have historical identifications with distinguished military units, famous battles, and various other events that are symbolic of patriotism. It is often assumed that possessions of this kind form thebasis for effective group attitudes favoring individual participation in military action. Whether that is true, or that such traditional attachments simply supply the stuff of holiday oratory, remains undetermined.

There is no question of the fact that individual attitudes are conditioned, if not determined, by the attitudes held by the groups of which he is a member.[1] But precisely which attitudes are effective in specific instances of behavior and the comparative powers of different attitudes are questions for which there are no ready answers. It is of interest to note, for example, that while in a national sample of 1200 interviews regarding attitudes toward conscientious objectors 74 percent of the respondents expressed disapproval, a subsequent study revealed wide variations in the intensity of disapproval.[2] The popular stereotype of complete ostracism by the community of the conscientious objector apparently is not supported in fact.

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[1] Cf. T. M. Newcomb and E. L. Hartley (eds.) Readings in Social Psychology (New York, 1947), 297-365.

[2] L. P. Crespi "Public Opinion toward Conscientious Objectors: II, Measurement of National Approval-Disapproval," Journal of Psychology, 19 (1945), 209-50, and "Public Opinion toward Conscientious Objectors, III, Intensity of Social Rejection in Stereotype and Attitude," ibid, 251-76.

Events of the past are probably much less important than are problems of the present and programs for the future in shaping group attitudes. Tradition seems to gain significance only so far as it can be brought into some logical relationship with current happenings and probable trends. Even so, it would seem to be mere rationalization for an attitude that is already expressed. This is not to say that some effective attitudes are of long standing.

B. Obligation to Inductees.

Group attitudes of obligation to protect the interest of the inductee during his absence may be a highly important factor in his readiness to enter military service. If his investment in his career or in his job seniority is placed in jeopardy by a temporary absence for military service for him entails a double risk. This was appreciated early in World War II and concerted efforts to provide security of economic positions were put forth. Unfortunately, the effects of these steps on the attitudes of individuals were not measured.[1]

The security of the individual's dependents is of the same order. Unless the community is willing to assume responsibility for the protection and economic well being of the inductee's family, he will enter military service only under compulsion and doubtlessly will make a poor adjustment to life in the armed forces.[2] Recognition of this fact

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[1] It is noteworthy, however, that when members of the armed forces were asked, in April and again in August 1945: How many leaders of industry and labor do you think will see to it that discharged soldiers will get a square deal? the percentage answering "most of them" did not exceed and it declined in the interim between the two months. (The American Soldier, II, 584)

[2] Some supporting evidence is at hand. AWOL's and psychoneurotics tend to be married in larger proportions than a cross section of the enlisted personnel of the armed forces (44 and 51 percent respectively, as against 36 percent). But these data must be used with caution, for controls on related variables are employed. (Ibid, I, 114-15) Twenty percent of AWOL's thought they should have been deferred from military service because they had dependents. (Ibid, I, 123.)

entered into official policy in the Servicemen's Dependents Allowance Act, of 1942, the terms of which proved fairly adequate so far as financial requirements are concerned. No instrument has been devised, however, which would enable the community to offer security in non-material respects. It cannot provide a husband or father surrogate, nor can it render the numerous petty, but important in the aggregate, services, that are available in the complete family. Perhaps the consequences of this incapacity on the part of the community will remain as one of the costs of war.

C. Community Participation in the Military Effort.

The feeling of deprivation in individuals selected for military service is minimized by the knowledge that the attitude of the civilian community is one of unrestricted participation in the military effort. The gap between soldier and civilian obviously has narrowed considerably under conditions of modern warfare. The necessity of mobilizing a military economy leaves no sector of the civilian economy undisturbed. War is brought even closer to the civilian community in the degree to which it is exposed to combat risks, and the rapid development of atomic weapons, guided missiles, operating ranges of aircraft and submarine, etc., strip the remnants of insularity from virtually every community. Thus an attitude of participation on the part of civilians is difficult if not impossible to escape. Nevertheless, it does not follow that all groups in a community will hold such an attitude with uniform intensity. And where there are perceptible differences in that respect, the attitude of the prospective serviceman tends to be qualified.[1]

[1] Surveys of opinions of members of the armed forces, in 1945, that a fourth or more of them thought that half or less of the people at home were doing all they could to win the war, and over 50 percent thought that certain groups had taken selfish advantage of the war. (The American Soldier, II, 583-85.)

A circumstance which might be expected to reduce the differences in intensity of civilian attitude toward full participation in a war effort is a real or assumed exposure to attack. In the United States at present this circumstance varies in different areas from communities that have actually felt the full impact of military attack (Pearl Harbor) in communities in which the feeling of exposure derives from their identification with the nation, which as a whole is or may be threatened with aggression. The extent to which such a condition is present in a locality will exert an important influence on the readiness of individuals for military service, for individuals are inclined to identify their own safety with that of the groups to which they belong.[1]

Excessive military mortality among the servicemen from a given community, as compared with that among servicemen from other communities, is a negative influence on the attitudes favoring participation. It is interpreted as an unequal sharing of war risks. This observation is commonplace, and has long been recognized by military leaders. As with so many other familiar generalizations, it has not been subjected to systematic analysis to determine how various factors influence the relationship between group attitude and military losses.

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[1] Cf. The American Soldier, II, 550.

D. Minority Status.

The phenomenon of dominant-subordinate group relations involves a set of group attitudes which weigh against a willingness of subordinate group members to engage in military service. The attitude of the dominant group favors admitting members of the subordinate group to menial services in the military establishment. The alternatives are to exclude them entirely and hence lose the advantage of their manpower, or to admit them to unrestricted participation with all of the implications of equality that would entail. On the other hand, subordinate group members are disposed to let the majority group claim all of the serious risks of military action. A long period of systematic discrimination and persecution offers little hope of important changes in opportunity; nor is it conducive to a happy sharing of the fortunes of war. The attitude of the American Negro in the last two World Wars, however, has been somewhat ambivalent. He has asserted the attitude of withdrawal that has been described. But at the same time he has viewed military service as an opportunity to demonstrate his equal ability to serve his country. Perhaps this misrepresents somewhat the Negro's motivation, for America represents the only home and the only civilization he knows and his inclinations to defend it tend to be the same as that of the white man.[1]

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[1] E. Franklin Frazier, "Ethnic and Minority Groups in Wartime, with Special Reference to the Negro," Amer. Journ. Sociol. XLVIII (Nov., 1942), 375.

III. Factors Influencing Change of Group Attitudes.

A. Mismanagement of induction procedures.

An ill-considered and casual procedure for the selection of candidates for military service may easily subvert group attitudes supporting the war effort. Fortunately for the United States, the Selective Service System has been carefully and wisely built and has always been responsive to needs for readjustment and improvement. A study based on a national sample of 1,024, conducted in 1942, reported complaints from only 9 per cent of the interviewees.[1] The dominant themes in these complaints are instructive. They protect against inequality of sacrifice, inconsistent and ambiguous policies, and a disregard for the security of inductees' families.

B. Inefficient Admininistration in the Military Establishment

The misuse of individual skills in military employment, favoritism in promotion and assignment to combat duties, excessive stock piling of scarce consumer goods, and wasteful practices of all kinds seriously endanger the support of military service derived from group attitudes. Knowledge of such malpractices, whether it be correct or distorted, invariably finds its way into the civilian community. And facts of that kind are extremely difficult to reconcile with prevailing concepts of patriotism, military honor, self-sacrifice, etc.

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[1] Office of War Information, Bureau of Intelligence, The American Public and Selective Service, Report No. 22, Division of Surveys, Aug. 18, 1942.

C. Stripping the Civilian Economy.

The induction into the armed forces of excessive numbers of men and women, the elimination of numerous civilian services, and the removal from shops and stores of large numbers of convenience goods are apt to so impair the functioning of the community that it cannot contribute effectively to national defense. The resulting frustration of supporting attitudes in the community may manifest itself in resistances to further inductions of individuals. The argument that no matter how straitened are life conditions in the civilian community it is still safer and more comfortable than the battlefield, overlooks the existence in the community of large numbers of immature and aged people as well as the simple requisites for maintaining family functions.

D. Inadequate Communication.

In a population accustomed to democratic procedures, appeals for cooperation cast in emotionally charged symbols and other propaganda instruments are seldom adequate. The long cultivation of rational processes leads to a demand for reliable information regarding the matter for which group support is sought. This is no less true of military than of other political matters.

Certain findings of a study having to do with war manpower mobilization seem to be pertinent here. The factors found to be associated with a readiness for compulsory mobilization (favored by 25 percent of the 1,024 persons interviewed) were four in number:

(1) realisation of gravity of the war; (2) clarity of thinking about the war; (3) appreciation of the importance of the manpower problem; and (4) satisfaction with the operation of selective service.[1] The first three of these obviously depend on the flow of correct information.

Effective communication is essential particularly in after-crisis periods to prevent radical shifts of attitudes away from continued support of war objectives. Inconclusive military victories, for example, call for a quick dissemination of factual information on the state of affairs. Likewise the end of a war does not necessarily mean an end of the need for a large fighting force, though public pressure may bring about that sequel, if it is not adequately and promptly apprised of the remaining problems confronting the nation.

E. Minority Status.

In a population containing a large assortment of minority groups, such as that of the United States, there is usually also a fairly well-marked status system in which each group occupies a more or less specific position. But given a situation of world war a radical realignment of minority groups with the majority group takes place. Thus the groups o

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[1] Office of War Information, Bureau of Intelligence, Mobilizing American Manpower, Report No. 23, Division of Surveys, Aug. 15, 1942. The use of orientation films on experimental and control groups of enlisted personnel to determine, among other things, the effect of knowledge of war events on willingness to serve failed to yield any reliable measures of effect. This, however, may have been due to the unsatisfactory indexes of motivation that were employed. (C. I. Hovland, A. A. Lumsdaine, and F. D. Sheffield, Experiments on Mass Communication, Princeton, 1949, 44-45.

foreign-born whose home areas are threatened or have been overrun by the enemy of the nation in which these groups reside rise to the status of allies, while other groups that formerly enjoyed a comparatively high status may suffer a loss of status because of their ethnic relations to the enemy. Still other minority groups may experience at least a temporary improvement if status position by virtue of the manpower they can supply to the labor force, or to the military establishment, e.g., the American Negro.[1] On the other hand, there is danger that changes of group role may move so much faster than changes of status that overt opposition to the changes may occur. This happened frequently to the Negro both as civilian and as soldier or sailor.

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[1] E. Franklin Frazier, op. cit.

CONTRIBUTIONS FOR THE WORKING GROUP ON HUMAN BEHAVIOR

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Job Studies

A. Analysis

1. Problems: There is probably a need for job research to be extended in the Air Forces to new military specialties, or for further studies of some important old ones. These job studies would have as their objectives the following goals:

   (1) To develop new selection and classification tests and procedures; (2) to plan more adequate training programs; (3) to aid in administering the Air Force Career Planning program; (4) to investigate operational efficiency, and personnel safety and fatigue; (5) to secure information for "human engineering" research on devices and equipment.

2. Applicable research data: Many studies of both aircrew and ground technical specialties were conducted during World War II, especially in the AAF Aviation Psychology Program and by the Personnel Research Section of the AGO. Post-war studies which are applicable are those conducted by psychologists in the Strategic Air Command and later at HRRL on GCA controllers, tower operators, and aircraft mechanics. The Aero Medical Laboratory of ATC has also conducted analyses of the bombardier-navigator-radar operator on very long range missions in the Arctic.

3. Service practices affected: Principally present classification and training procedures. Probably also certain operational procedures as now carried on.

4. Recommended action (additional research):

The most critical specialties for new or extended job analyses are suggested to be the following:

a. Jet aircraft pilots

b. Aircraft controllers (tower, GCA, GCI, ADCC)

c. Aircraft mechanics and maintenance specialists, especially of radio and radar equipment.

d. Engineering or maintenance officers

e. Bombardier-navigator-radar operators

II. Personnel Classification and Standards

A. Classification

A-1. Emphasis on the Selection and Training of Specialists in The Air Force

1. Problem: It is an old military tradition that a properly trained officer can handle all or most of the assignments of a post or headquarters. This point of view is no longer tenable in the age of tremendous technical advancement and increasing complexity in which we now live. If the military organization is to provide adequately competent operations in such diverg areas as engineering, finance, supply, and maintenance it must follow the lead of civilian industry and make greater use of specialists who have been initially selected because of aptitude or background, and who have been adequately trained and given sufficient job experience to provide "seasoning". In short, to a much greater degree than is now being done, the military should plan ahead for selection, and special training

and assignment, of personnel whose duties will be limited to a relatively specific area of activity.

2. Applicable principles: Large and complex industrial organizations have tended toward increasing specialization of assignment among employees for many years. It seems feasible to utilize management planning experience and personnel from large corporations in developing a program of increasing specialization of duty in the military services. Results should become manifest both in terms of increased efficiency of operation and in improved personnel morale. Relevant past experience, special aptitudes, and personal preference should be considered as bases for the selection of military personnel for specialist training and duty.

3. Service policies and practices affected: Some of the Air Force special assignments for which specially selected and trained personnel should be provided are the following:

   a. Equipment maintenance supervisors and inspectors
   b. Operations officers
   c. Air and ground accident investigators
   d. Communications and electronics officers
   e. Supervisors of training programs, especially of on-the-job training
   f. Achievement evaluation (job proficiency assessment) experts, especially for flying and various ground technical specialties

4. Recommended actions:

a. Service policy----consideration of the ways and means of instituting an extensive program of specialization of personnel assignment and training. This new policy would gradually supersede the present one of training officers for a wide variety of duties through successive assignment to various schools.

b. Additional research---job surveys and/or analyses to determine personnel requirements for the various specialties; development of aptitude and proficiency tests for these specialties.

A-2 Selection of Personnel for Military Duty in the Arctic

1. Problem: Since extensive military operations may be necessary in polar regions in the future, continued emphasis should be given to the problems of human adjustment on long duty tours in cold and isolated areas of the earth. It is a hypothesis worth testing that not all personnel are affected in the same manner and to the same degree by such rigorous and abnormal conditions of living. If this be true, research should be undertaken to determine the physical and psychological characteristics of those individuals best and worst adapted to operations in the Arctic.

2. Applicable research data: Several studies have recently been undertaken by medical research agencies to explore the above hypotheses. Two pertinent studies have been published by psychologists in HRRL. These have suggested a number of questions for further investigations as well as possible changes in military practice in Arctic regions.

3. Service policies and practices affected: Such practices as manner of initial assignment, length of duty tour, facilitess and recreation provided, length of daily duty assignments, etc. would be influenced by findings of research designed to explore the problem stated above.

4. Recommended action:

a. Service policy---more attention to the morale and mental health of personnel assigned for long periods at Arctic stations.

b. Additional research---investigation of the causes of maladjustment in the Arctic; attempt to utilize this information in the development of selection procedures.

III. Personnel Administration and Control

A. Training

A-1. Need for Standardization of On-The-Job Training Programs

1. Problem: Extensive use has been made in civilian industry in recent years of on-the-job training of employees. Especially since the end of World War II the Air Force has also employed on-the-job training extensively, especially in the fields of aircraft and equipment maintenance On-the-job training of mechanics and other maintenance personnel in the Air Force is apparently left up largely to the individual bases for administration and supervision. In order to obtain satisfactory results from on-the-job training, it is necessary to standardize the courses of instruction from one base to another, to provide adequately trained instructors, and to establish means of evaluating the courses of training. There is evidence that in the Air Force on-the-job training programs, as they have existed since the end of World War II, are characterized by a number of deficiencies.

2. Applicable Research Data and Principles: The experience of private industry should be available to the military services in the matter of setting up and evaluating a number of on-the-job training programs. Several investigations have been made in the Air Force within the past two or three years relative to various deficiencies now existent in the training of ground crew maintenance personnel. The results of these studies should be easily available for a consideration of the present difficulties involved in on-the-job training programs, and possible means of their improvement.

3. Service policies affected: A thorough examination and revision of present procedures for setting up and administering on-the-job training programs in ground technical specialties is indicated.

4. Recommended action:

   a. Service policy----initiation of the survey and revision indicated in the preceding paragraph.

   b. Additional research----job analyses of the technical specialties involved in order to set up scientific curricula, training standards, and means of evaluating achievement attained in the training programs.

A-2. Emphasis on Apprenticeship Experience in the Training of Ground Technical Specialists

1. Problem: Operating personnel frequently observe that aircraft and instrument mechanics, ground controllers, and other technical specialists who have recently graduated from Air Force training schools still require a considerable period of "seasoning" before they attain an adequate

degree of technical proficiency on the job. This problem is particularly acute in the Air Force today because of the fact that following the war large numbers of trained and experienced technical specialists were separated from the service, leaving a severe deficiency of "seasoned" personnel.

2. Applicable Principles: Civilian industry affords a number of examples of the fact that considerable on-the-job experience is required for most technical employees following completion of technical training courses in schools. The nature and extent of the experience of course depends upon the type of technical specialty involved.

3. Service policies and practices affected: In the case of such critical ground specialities as maintenance personnel and controllers, the Air Force should give high priority consideration to the problem of providing an adequate number of "seasoned" technical specialists as early as possible. A solution to this problem may imply calling up of reserves. It should be frankly admitted that the output of young trainees from the technical schools will not provide a solution the problem for years to come, if ever, since periods of enlistment commonly expire by the time a man has been adequately "broken in" for his special technical assignment.

4. Recommended action: (Service Policy) Steps should be taken to attack and solve the problem indicated briefly in the preceding paragraph.

B. Education---No contributions.

C. Measurement of Proficiency

1. Problem: The measurement of job proficiency is now considered to be a fundamental problem in civilian industry. It is no less necessary and fundamental in the military services Accurate and reliable assessment of proficiency

serves the following purposes: (1) validation of selection and classification procedures; (2) achievement evaluation of training programs; (3) to set up standards of promotion and/or termination; (4) purposes of special assignment. It is not too much to assert that it is impossible for military leaders to assess the strength or efficiency of their organizations with ut reliance upon some sort of an adequate method of personnel proficiency assessment.

2. Applicable Research Data and Principles: During the war and since considerable research has been done in the military services concerned with the development of proficiency measures, often to furnish sources of criterion data. For aircrew most of this pertinent research is reported on the research reports of the AAF Aviation Psychology Program. Pertinent research on the development of proficiency measures for ground maintenance personnel and controllers has been conducted by the Human Resources Research Laboratories. Much related research information is available from civilian industry studies.

3. Service policies and practices affected: The purposes served by adequate proficiency measures were indicated in Paragraph 1 above. Some of the occupational specialties which appear to be most critical of proficiency research in the Air Force are the following: (1) pilot; (2) bombadier-navigator-radar operator; (3) flight engineer; (4) a wide variety of ground maintenance technicians; (5) several types of ground controllers.

4. Recommended action: (Additional Research) Depending upon the particular specialty involved, research should

be done on the assessment of proficiency along for dimensions: (1) technical proficiency; (2) adequacy of personal-social relations; (3) motivational and morale aspects of job success; (4) supervisory ability.

D. Evaluation of Selection and Classification Procedures Beyond the Training Command

1. Problem: Since the end result of the efforts of the Air Force Training Command is the production of effective personnel at the operational level, it is strongly advisable to develop proficiency measures for personnel assigned to duty in the operational commands (Strategic Air Command, Continental Air Command, Military Air Transport Service) for the additional validation of selection and classification procedures. Such research would involve close liasion between research psychologists now assigned to the training command and research units such as that at AFRL assigned to the operational commands.

2. Applicable Research Data: Exploratory research was done in this area as far as aircrew was concerned during the war by the AAF Aviation Psychology Program and reported in one of its research reports.

3. Service policies and practices affected: Provision of time, facilities, and research personnel to develop proficiency measures for various duty specialties in the operational commands.

4. Recommended action: Same as that indicated in preceding paragraph.

B. Investigation of the Regular Transfer of Military Personnel

1. Problem: It has been common military practice to transfer military personnel regularly from one location to another and from one type of assignment to another. This military tradition is in marked contrast to practices followed in civilian industry. While there are sound arguments for this policy, it can also be argued that serious disadvantages are involved. Most important of these is that frequent transfer of key military personnel from one assignment to another precludes a continuity and smoothness of operation that might better be achieved by leaving personnel assigned for much longer periods in the same location. It has been observed that all too frequently civilian personnel in an office afford the only means of achieving a continuity of operation or policy. This has been observed by the contributor in the following operations of the Air Force: (1) communications; (2) ground maintenance operations; (3) research on the development of proficiency measures; (4) aircraft accident research.

2. Applicable research principles:

(None)

3. Service policies and practices affected: Present military policy of transferring personnel periodically would be modified, at least in the cases of certain key personnel in critical specialties.

4. Recommended action: (Service policy) A survey should be made of the relative advantages and disadvantages attendant upon present policy of regularly transferring all military personnel. Consideration should be given to the

feasibility of leaving personnel under critical conditions in fixed assignments for much longer periods of time than has hitherto been done.

F. Increased Emphasis on Ground Maintenance of Aircraft and Equipment

1. Problem: From a number of sources it is reported that equipment and Aircraft maintenance in the Air Force today is beset by a number of practical difficulties. It can hardly be debated that maintenance is one of the most, if not the most, critical operation conducted by the Air Force. Missions cannot be flown unless equipment is in working condition! Problems of the improvement of maintenance should receive every attention from Air Force planning personnel today.

2. Applicable principles: Various reports have been made since the end of World War II indicating specifically some of the difficulties with which maintenance supervisory personnel must contend.

3. Service policies and practices affected: Less distinction should probably be made between flying personnel and ground maintenance personnel, in the matter of status, promotion, and weight in determining policy. Maintenance personnel should probably be more carefully selected and trained, and better motivated by more rapid promotion and other means where feasible.

4. Recommended action: (Service policy) Specific steps should be done to implement the suggestions made in the preceding paragraph. Revision of promotion schedules for

maintenance supervisory officers is one step. Providing for the opportunity for high grade maintenance enlisted personnel to become warrant officers is another. Other steps that might be taken are: a program designed to achieve greater familiarization on the part of pilots with maintenance problems and procedures; an improved training of aircraft and instrument mechanics; a more careful MOS assignment desiged to improve the morale of ground maintenance personnel.

3. Emphasis on Improved Personnel Classification

1. Problem: Probably the most serious source of low morale among military personnel is a real or fancied "mal classification". Traditionally military personnel appear to be unhappy over their respective assignments. While some of this is probably not basically serious, and while some other is probably unavoidable, it nevertheless should be considered to what extent this source of low morale might be improved.

2. Applicable principles: Recent research on job attitudes and worker morale in industry have indicated the importance of job assignment, supervisory relations, and related factors. Some of the findings from civilian industry might well find application in military occupational specialties.

3. Service policies and practices affected: Present classification procedures might well be revised in an effort to attain a greater efficiency of classification, but particularly improved personnel morale.

4. Recommended action: (Service policy) So far as possible classifications should be made in line with the individual's preference, his previous experience and training, and special abiliti

The use of interviews ... perhaps the collection of detailed "personal data" prior to classification is implied in the above suggestion. The feasibility of these suggestions depends upon the flow of personnel to be classified and the availability of classification staff.

Improvement of Liaison Between Higher and Lower Military Echelons

1. Problem: There is evidence that in a wide variety of military operations (the present contributor is most familiar with the Air Force) mutual understanding of problems, difficulties, and objectives, between higher headquarters and lower headquarters or bases, is far from ideal. At the planning and policy making level there is sometimes a lack of understanding of the basic problems and difficulties confronting operating personnel at base level. Conversely, base operating personnel do not always understand the reasons behind the promulgation of new regulations handed down from higher headquarters. The present contributor has noticed this dificiency of liaison during or since the war in the following areas: (1) administration of the AAF Aviation Psychology Program during the war; (2) administration of the on-the-job training program for ground maintenance crews since the war; (3) administration of accident investigation and accident prevention procedures; (4) procedures involved in air to ground and ground to air communications; (5) administration of standard proficiency tests.

2. Applicable principles: The problem of adequate liaison is an old one in both military and civilian industrial operations. Various methods have been proposed and tried to improve the communication link coming up from the "field" to the manage-

ment level to the operating units. Research in modern industrial psychology and personnel management has uncovered some relevant principles which may be of assistance to the military services in improving liaison.

3. Service policies and practices affected: Either certain hea quarters personnel would be given the time for systematic a periodic visits to lower headquarters and to bases for lia purposes, or special liaison officers might be assigned if personnel and time permitted. Some of the specific duti such liaison officers would be the following: (1) to lear the problems confronting the field operating units; (2) to learn the inadequacies and difficulties of present regula (3) to assist headquarters personnel in the preparation of proved and more practical regulations; (4) to interpret he quarters policy to operating personnel.

4. Recommended action: (Service policy) Necessary steps to se action proposals contained in paragraphs above.

IV. Morale

A. Leadership (No contributions)

B. Human Relations (No contributions)

C. Safety

1. Problem: Accident prevention is as important a prob for the military services as it is for civilian indus especially automotive and aviation transportation. A the services, particularly the Air Force, are cogniza the importance of the problem of safety. Numerous co ences have been held on this subject in the recent pa as a result several research projects are now in prog

However, additional research would seem to be necessary in such areas as accident investigation and reporting, the development of accident occurrence criteria, the determination of the effectiveness of accident prevention programs, the concept of "accident proneness", and similar related problems. Future research should be applied to both air and ground safety.

2. Applicable research data: There is a wealth of research results in the field of accident prevention. Many of the studies on industrial accidents are pertinent to military problems. For military vehicular accidents research by the automotive and street railway transportation industries are especially pertinent. The research of Mr. J. S. Baker of the Northwestern University Traffic Research Institute is particularly relevant to problems of accident investigation and analysis. The various studies relating to the concept of "accident proneness" have considerable significance for the Air Force, especially as applied to aircraft pilots. The studies of Horne and others appear to support the hypothesis that certain pilots may be "accident prone". On the other hand, Henneman and Mitchell have criticised the concept following in general the line of argument used by H. M Johnson in criticizing the same concept as applied to automobile drivers.

3. Service policies and practices affected: Depending upon the outcome of further accident research, a number of service policies might be affected. Some of these would be personnel assignment, training procedures, safety regulations, investigation and analysis procedures, the treatment of accident repeaters, the

administration of safety discipline, and so forth.

4. Recommended action:

a. Service policy---a different type of selection of vehic drivers (whose morale is now reported to be almost univ sally low) might be effective in reducing the accident among this type of personnel. Special pilot training i emergency procedures following materiel failure might also tend to reduce accidents partly involving pilot er and partly springing from mechanical failure. Accide t vestigation and reporting procedures should probably be widely revised, to bring them more in line with some o: recently worked out techniques evolved by civilian age Better results in the field of accident investigation s be achieved by having central boards of expert analysts investigators, rather than leaving accident investiga personnel on local bases. Serious consideration might given to the affect on pilots of the present regulatior calling for a meeting with a Flying Evaluation Board fc pilots involved in any type of personnel error accident or more times within a period of five years.

b. Additional research---the following specific problems s suggested for accident research: (1) the development o better criteria of accident occurrence (equating risk, (2) "human engineering" research to improve equipment. the development of improved techniques of accident inve gation and reporting. Here are involved such question: what data are needed, how they should be obtained, and recorded. (4) the evaluation of the concept of "accid

proneness" as applied to aircraft pilots. If the concept is a valid one the percentage of accidents attributable to such pilots should be determined. (5) evaluation of safety education programs and the effects of accident discipline regulations. (6) investigation designed to develop more objective measures of "pilot error" in accident causation. Apparently there is considerable disagreement among the findings of different accident investigation boards as to the degree of "pilot error" involved in aircraft accidents. It seems also to be true that at the present time a jet pilot might be assessed with "pilot error" in an accident investigation by a board consisting of pilots none of whom has ever flown a jet type aircraft. If a greater degree of clarification and objectification of the concept of "pilot error" could be achieved it would be a distinct contribution to flying safety in the Air Force.

FATIGUE

An Investigation of the Fatigue Effects of Very Long Range Missions on Aircrew Personnel.

1. Problem: It has been frequently reported by aircrew personnel that excessive fatigue and other ill effects resulted from participation on long range missions, particularly those over Arctic terrain or over water. Reports of visual fatigue have been especially frequent from radar operators. These reports should be investigated in order to determine the true extent of fatigue-producing conditions and possible means of removing or alleviating them.
2. Applicable Research Data: There exists a fairly large amount of research knowledge derived from investigations of fatigue

in civilian industry. One or two studies of visual fatigue resulting from continuous observation of radar scopes are included among the OSRD reports.

3. Service Policies and Practices Affected: Several policy changes might be put into effect depending upon the findings of the investigations. On large aircraft, relief crews might be provided. Warning devices might be installed in the radar equipment to alert the operator in cases of the appearance of new target data.

4. Recommended Action (additional research): Job studies should be undertaken of various types of aircrew duties involved on very long range missions, with special reference to visual fatigue associated with continuous observation of radar scopes.

Investigations of Fatigue Effects Induced by Heavy Traffic Conditions In Ground Controllers.

1. Problem: It has been reported by both civilian and military controllers (GCA, tower operators, control center operators) that under conditions of heavy air traffic a very serious strain of divided attention and emotional pressure is placed upon control personnel. Such periods of "pressure" are usually of relatively short duration and occur only periodically, but are serious sources of possible errors of judgment which might in turn lead to serious accidents.

2. Applicable research data: The studies in the psychological literature on divided attention, distraction and emotional pressure are applicable to the military situations described above.

3. Service policies affected: Possible provision of relief crew or more sets of communication equipment, or revised control procedures.

4. Recommended action (additional research): Systems research of control tower, GCA units, GCI units, and defense center units should be undertaken to determine the efficiency of present operating procedures, sources of fatigue and error, and possible remedies.

Human Engineering

A. Perception

Basic Research on Depth and Distance Perception.

1. Problem: It is generally agreed that existent depth perception tests have very limited validity for aircrew duties, especially those of the pilot. Some of the questions requiring an answer are the following: (a) What are the basic cues to depth perception? (b) What is their relative importance? (c) What is the extent of individual differences in the use of cues? (d) How susceptible to training is the effective use of these cues? It would be advisable to conduct this research in situations involving large distances and affording an opportunity for the usual cues of depth, distance and motion to operate.

2. Applicable research data: Some exploratory research in this area was done by the Perceptual Research Unit at HQ, AFTRC, during the war. J. J. Gibson further discusses this type of research in a volume on perception now in process of publication.

3. Service policies affected: None

4. Recommended action (additional research): An extensive research program designed to answer such questions as those indicated in paragraph 1 above. The possible use of moving pictures should be carefully considered.

Investigation of High-Altitude Effects on the Visual Perceptu of Pilots.

1. Problem: Instances have been reported of jet pilots becom dull and unresponsive to their flight instruments due to partial anoxia on high-altitude flights. It has been fur reported that pilots in such a condition have been aroused by high-volume voice stimulation over the radio telephone
2. Applicable research data: A considerable body of experi results from many studies in aviation medicine, related t the effects of high altitude and anoxia, are available.
3. Service policies affected: None.
4. Recommended action (additional research): Experimental should be made in the laboratory to determine the effec ness of periodic intense auditory, cutaneous or visual s lation in combatting "drowsiness" induced by anoxia and monotonous visual stimulation.

B. Device Development and Evaluation (No contributions)

C. Display and Control Equipment--Communication.

Improvement of Voice Communication Procedures.

1. Problem: The development of high-speed aircraft has led to recognition of a number of deficiencies in voice communication--its slowness, its inaccuracy and over-saturated radio channels. There is a basic need to spee up and to lessen communication errors in auditory presentation systems. Code words as presently used seem not t have been derived from any fundamental research on voice communication.
2. Applicable research data: During the war a number of research studies were conducted by OSRD and the Harvard

Psycho Accoustic Laboratory. Since the war ONR has had several research contracts (with Dr. Black, Dr. Steer and others) in this area. The University of Virginia and MIT are currently investigating the practical limits of speech speed-up.

3. Service policies affected: None

4. Recommended action:

   a. Service policies--Efforts should be made to improve radio-telephone procedures and discipline in current operations.

   b. Additional research--Further research is needed in such areas as the following: (1) The formulation of ideas into verbal messages; the advice of linguists should be utilized. (2) The possibilities of greater standardization of voice messages should be investigated. (3) The practical intelligibility limits of speeded up or compressed speech should be determined. (4) Research is needed to determine the possibility of more effective radio-telephone procedures by operating personnel.

Message Analysis of Communication in Principal Military Operations.

1. Problem: Essential to the basic improvement of existing communication systems or to the development of new equipment and procedures is a thorough knowledge of the message populations involved. Almost certainly the optimal communication system depends on the nature of the information which has to be exchanged (e.g., navigation data, traffic control, weather information, target data, etc.).

2. Applicable research data: Several message-analysis studies

are now in progress for the Air Force. Aero Med Lab of AMC has two such projects, while HRRL is conducting another. The CAA is also doing an analysis of traffic control communication data.

3. Service policies affected: None

4. Recommended action:

   a. Service policies--Sample recordings should be made, ... feasible, of messages exchanged in typical operations ... future analysis.

   b. Additional research--Studies should be undertaken to collect message data systematically and to analyze ... for detailed classification of the information actually exchanged on principal communications operations. Majo message categories and sub-headings should then be related to speech or visual symbols best adapted to conv... the attached meanings.

Comparison of the Relative Efficiency of Auditory and Visual Co...munication Systems.

1. Problem: It has been recently proposed by aeronautical engineers of the Air Force to supplement voice communicatio by visual data presentation systems. Since these two sense have obvious advantages and disadvantages as communication channels, it is necessary to investigate the conditions determining their relative effectiveness. There exists considerable controversy among the opinions held by operations communications personnel.

2. Applicable research data: The research literature on the effectiveness for learning and retention of materials pre-

sented visually and aurally, applies to this problem. The Aero Med Lab of AMC has a research contract now investigating this problem. Preliminary evidence from this contract (University of Virginia) indicates the superiority of auditory presentation under conditions of divided attention.

3. Service policies affected: None

4. Recommended action (additional research): Laboratory research should be undertaken designed to answer the following questions: (a) What are the relative effects of anoxia on the interpretation of voice and visual signals? (b) What is the relative efficiency of continuous simultaneous visual presentation of data as opposed to periodic sequential auditory presentation? (c) What is the influence of the type of message data on the relative efficiency of visual and auditory presentation? (d) What is the influence of the type of activity engaged in by the receiving operator upon the relative efficiency of visual and auditory presentation?

Investigation of the Optimal Division of Data Presentation Between Auditory and Visual Communication Systems.

1. Problem: Closely related to the problems indicated above is the question of how much, and what kind of message data could best be presented visually and how much left to the radiotelephone voice system. This problem is already recognized as a fundamental one by both civil and military aviation research personnel for such operations as air traffic control, air navigation and tactical control.

2. Applicable research data: Some of the systems research sponsored by the Navy during the war applies to this problem. A very few

of the studies comparing the auditory and visual presentation of academic and advertising materials are also relevant. Research bearing on this problem is now in progress at the Naval Electronics Laboratory. Research on "Flybar" conducted by ONR may also be applicable.

3. Service policies affected: None

4. Recommended action (additional research): Starting with a given message population, a research program should be undertaken to determine the relative intelligibility of the same amount and type of data visually, aurally and in a combined audio-visual presentation system. The number of factors involved are so complex as to demand an extensive laboratory research program.

Investigation of the Multi-Sensory Presentation of Data for Communication Purposes.

1. Problem: Because of the complexities of the information that has to be presented to operators in brief spans of time in modern military communication, it might be feasible to utilize other senses than vision and audition for the presentation of data. This possibility should be investigated and strongly considered.

2. Applicable research data: Two contracts sponsored by ONR apply to this problem. The Kenyon College project on the "Buzz Bonnet" (impact-audible signal system for flight training) is closely related. The University of Virginia contract is conducting exploratory research on cutaneous sensitivity for possible application to communication needs.

3. Service policies affected: None.

4. Recommended action (additional research): Exploratory work such as that now in progress at the University of Virginia should be continued. Possible extension of such research to other sense fields should be considered.

D. Psychological Systems Research

Investigation of Human Operator Limits in Divided Attention Situations.

1. Problem: It is frequently and insistently reported that in certain types of military operations (e.g., Navy CIC's, AF control centers, etc.) the operator is presented with more data in complex changing situations than he can "keep up with". Air Force operating personnel generally maintain that the visual sense channel of the pilot in modern aircraft is already "over-saturated". These reports call for some modification of the presentation system or for the number and distribution of operators.

2. Applicable research data: The classical literature on divided attention may yield suggestions that can be applied, though the above problems have not been directly attacked. During and since the war the Navy has sponsored systems research on CIC operations and related problems. The Aero Medical Laboratory of AMC has also done research in this area. Dunlap & Associates are currently conducting research for both the Navy and Air Force bearing on the above problem.

3. Service policies affected: (None)

4. Recommended action: (Additional research) Research is needed, starting with job studies of several of the important control centers where information needs to be presented and coordinated

and control decisions made rapidly. The information thus obtained should be applied in devising laboratory experiments to determine the basic factors limiting successful operator devision of attention in multiple stimulus -- differential response situations. A critical question to be answered is whether or not the locus of "interference" involved in divided attention is peripheral (sensory) or central (neural). Upon the answer to this question depends the feasibility of the effective employing of several senses as channels of communication.

HBM 200/1 Appendix 92

ADAPTATION OF CURRIC'LA IN OFFICER EDUCATION TO STUDENT CAPABILITIES AND CHARACTERISTICS

Human Resources Research Center

Prepared for
THE WORKING GROUP ON HUMAN BEHAVIOR
UNDER CONDITIONS OF MILITARY SERVICE

Department of Defense
Research and Development Board
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HBM 200/1 Appendix 92

ADAPTATION OF CURRICULA IN OFFICER EDUCATION TO STUDENT CAPABILITIES AND CHARACTERISTICS

HUMAN RESOURCES RESEARCH INSTITUTE
AIR UNIVERSITY

Requirement

The Air University has asked the Human Resources Research Institute to do research pertinent to the scientific development of school curricula. In this connection, it must be recognized that curricula are not "scientifically" sound unless they are constructed with full knowledge of the characteristics of the student population. "Scientifically" sound curricula make capital of student motivations, aptitudes, and interests; they build upon the experiential background of students; they include content adjusted to the intelligence and maturity of the students and they employ methods best suited to the students. In specific, an Air Force curriculum is not sound if it does not challenge students or seem related to their needs, if it contains content that is repetitive of content long since learned elsewhere, if its methods are suited to children but not to adults, if materials to be studied are written at too low or too high a level of reading difficulty, etc.

General research on student characteristics which condition or affect the learning process is confined to studies with school children. There is no published research on the adaptation of curricula to student characteristics at the college or adult level. Authorities on adult education (Bryson, Thorndike, etc.,) are agreed, however, that the complexity of interests characterizing adults must be considered in planning programs of instruction for them. A survey commission reporting

1949 to the Commanding General, Air University, expressed this same sentiment about curriculum-development in Air University schools.

> . . . the complexity of the learning situations . . . should be suited to the background and abilities of the students.[1]

It is recommended that research be undertaken to characterize the student populations of Air Force schools for officers - to identify their interests, knowledges, aptitudes, and emotional patterns, as well as their intellectual capacity. This type of study should be followed by experimentation with methods, content, and learning situations, to ascertain best procedures for capitalizing upon the characteristics which the officer students bring to the learning situation. The outcome of such investigation may be recommendation for grouping students, according to selected criteria, for differential instruction within the same curriculum or for differentiating within curricula by a system of constants and electives.

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[1] Air University Human Resources Research Institute, "A Report to the Commanding General, Air University, of an Educational Survey of the Air Command and Staff School," Maxwell Air Force Base, Alabama, 1949.

THE DEVELOPMENT AND MAINTENANCE OF MOTIVATION IN TRAINING AND CAREER DEVELOPMENT

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Prepared for
The Working Group on Human Behavior
Under Conditions of Military Service

Department of Defense
Research and Development Board
Washington 25, D. C.

June 30, 1951

1. Statement of Topic

THE DEVELOPMENT AND MAINTENANCE OF MOTIVATION IN TRAINING AND CAREER DEVELOPMENT

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a. Motivation is primarily the desire to engage effectively in assigned service activities. A high level of motivation can be brought about (1) by the proper utilization of motivations inductees bring with them into service and (2) by creating those service conditions which stimulate and maintain vigor and persistence in service tasks.

b. The proper channeling of the motivations of inductees into service activities can be fostered by realistic recruiting information, by reducing the "shock treatment" aspects of basic training, and improvements in procedures of classification and assignment.

c. The motivational stimulation of service situations depends upon a great number of factors. Among these are (1) the effectiveness of the system of punishments and rewards, (2) the accuracy and extent of information men have about their situations and their progress, (3) the difficulty and monotony of jobs, (4) the intensity of value conflicts; (5) the strength and nature of the informal pressures for group conformity, and (6) the quality of leadership. A central determinant of the level of motivation is to be found in the area of personal relations. Whether or not an individual will work hard and be satisfied to do so seems to be more a function of group standards and other informal social pressures than of the formal system of incentives.

d. Recommendations for policies and practices include the following: (1) improvement in the administration of punishments and rewards, (2) increasing realism in training activities, (3) extension of orientation practices, (4) greater attention to the importance of group solidarity, particularly in combat units, (5) increased leader training on problems of managing human relations, (6) reasonable attention to men's general interests in initial and subsequent assignments, and (7) more care in informing men of their progress.

e. Recommended research includes (1) evaluation of the effects of orientation programs, (2) the development of adequate criteria of motivation, (3) study of the effectiveness of group rewads and punishments, (4) investigation of factors conducive to group solidarity, and (5) studies of the motivational influence of homogeneous grouping in training situations

3. Review of Applicable Research Data and Principles

a. The Problem of Motivation

(1) Meaning of motivation. "Motivation," as used in this report, is much the same as morale. It has two major aspects: (a) desire to effectively engage in assigned activities, and (b) a sense of satisfaction with the required tasks. In military situations, the first of these is the most important and is therefore given primary emphasis in this paper. However, it is generally recognized that zeal for an activity cannot be easily sustained when the activity brings no sense of satisfaction. Intense motivation on the part of an individual or group is evidenced by a high level of achievement or efficiency, persistence in the required activities, and personal and group expressions of interest and desire.

(2) The problem of motivation in the armed services. Effective accomplishment of the military mission requires that each member of the armed forces pursue his designated functions with utmost vigor and with the highest possible degree of satisfaction. The realization of this condition is the problem of motivation in service situations. Solution of the problem requires (a) that attempts be made to utilize motivations which inductees have when they entered service, (b) that efforts be made to stimulate motivation in those service activities where it is lacking, and (c) that motivation be maintained where it is adequate. Since the conditions which stimulate motivation are generally those under which it is maintained, the development and the preservation of motivation are discussed together in this report.

In a sense, all three phases of the solution of the problem of motivation have to do with channeling the direction of motivation

rather than raising the level of expression. The problem is not so much that of increasing the sum total of individual or group motivation for all activities but how to devert more energy toward effective accomplishment of required military assignments. This can be efficient accomplished only by identifying and properly manipulating the personal and environmental factors which influence motivation.

The basic principles of motivation are much the same for all activities, whether they be training tasks, non-combat jobs, or combat jobs. However, the pressures of some motivational forces are likely to be greatest in one of these situations while others are more important in other situations. In the following review of research an effort will be made to indicate the primary motivational forces in training, in non-combat jobs, and in combat jobs.

b. Methods of investigation.

Three main types of investigation have been used to study the problems of motivation in service situations: Questionnaires, systematic interviews, and individual case studies. The most extensive questionnaire studies which have been made are those of the Army Air Force Aviation Psychology Program (27, pp. 122-182) on motivations of combat and returned personnel; and those of the Research Branch, Information and Education Division, War Department (24). These latter studies cover a great variety of subjects related to ground and aerial combat motivations, job satisfactions, and objective factors in morale. The Directorate of Technical Training Research of the Air Training Command Human Resources Research Center is now conducting extensive questionnaire research on morale of students and instructors

in Air Force Technical Training Schools.

Systemmatic interview studies on combat motivations have been made by Hastings and others (12) and by Rogers (20). An interview study of the motivational situation in Air Force Technical Schools was recently made by personnel of the Human Resources Research Center (13).

An excellent example of the individual case study approach in the study of motivational factors is that of Grinker and Spiegel (10) who were concerned with the combat and post combat reactions of AAF personnel.

More searching methods are now being brought to bear on motivational problems. Sociometric methods, for instance, are being used by personnel of the Directorate of Technical Training Research in studies of group influence upon motivation of their members.

While considerable research has been conducted in the military services on motivational influences, knowledge of such influence stems largely from research done in other contexts, namely in public school, college, and industrial settings.

c. Utilization of motivation which the inductee brings with him.

(1) Recruiting policies. While there is no systematic research on the subject, it is the impression of many observers that too many recruiting sergeants give potential recruits an unrealistic picture. The result is that the recruit is often unprepared for the shock of basic training and other arduous service situations. An honest picture of the service at the recruiting level could prevent this.

(2) Basic training. The basic training period is often one of severe strain. The service is here attempting to induct men into a new culture in the matter of a few weeks. On the basis of an observational

analysis, Suchman and others (24, Vol. I, pp. 411-12) describe this peroid as a "shock treatment." As in many military situations, the formal controls emphasise fear and punishment with little prospect of reward for outstanding achievement. Such treatment is likely to adversely affect the initial attitude of the recruit.

(3) Classification and assignment. While classification and assignment form the scope of other reports, it is well to point out two major aspects of these activities which are vital in the proper utilization of the motivations which men bring with them into the service. These are (a) consideration of background factors in classification and assignment procedures, and (b) attention to the initial interest and desires of the men.

Factors other than aptitude appear to be of importance in determining whether or not a man(s morale will or will not be high when he is given a particular job. Morale is a relation between the whole person or group and the tasks with which the person or group is assigned. Stauffer and others (24, Vol. I) found that such factors as age, education marital status, and early experiences influenced significantly the manifestations of various aspects of motivation in service situations. For example, the data indicate that younger men tend to be more willing to accept combat than older men, and that the unmarried are more likely to accept it than the married (p. 343). From a study of the conditions between precombat personality structures and failures under combat stress, Grinker and Spiegel (10, p. 11) concluded that "it is possible to delineate certain 'personality profiles', + combinations of unhealthy motivations with unsuitable emotional trends, who can be expected to have difficulties in combat." Personality factors

are no less important for motivation or morale in training and non-combat jobs. Men respond differently to activities done individually and and those done in groups, to tasks requiring precision as against tasks requiring strength, etc. While such factors may be partially taken care of in aptitude tests, they deserve increasing attention in attempts to place the right man in the right job.

The problem of motivation is particularly acute in pilot training. In the 1949-50 basic pilot training classes about 30% of all eliminations were attributed to motivational reasons. A specially constructed Attitude Survey designed to measure morale among Aviation Cadets was found to correlate (rbis) about .45 with graduation-elimination in several 1949-50 basic pilot training classes (26a). A battery of tests is being developed (26a) to predict eliminations due to motivational reasons which will supplement the existing Aircrew Classification Battery. Screening out the motivationally unfit is only a partial solution to this pilot training school problem.

A classification procedure to which some attention is now being given is that of taking men's interests into account (24, Vol. I., p. 285). The men are generally asked to state their preference of schools and jobs. It is obviously undersirable, even if it were possible, to place all men in the specific activities which they request. Men's choices are frequently unrealistic and often do not correspond to the needs of the services. However, there is a recognized need for instruments that will better identify a man's general interests. Placement in accordance with general interests will probably be better both for the man and for the services than when interests are not condsidered at all or when the man is given the specific job of his choice.

The proper utilization of men's initial motivations is not simply a matter of what is done in recruiting, basic training, and classificat and assignment. It is also a matter of establishing those job conditio and social influences which maintain and further stimulate the initial motivations which can be channeled into military activities. Following is a discussion of research bearing upon some of the factors which are important in the development and maintenance of motivation in service situations.

d. Development and Maintenance of Motivation

(1) Incentives. Incentives include rewards or gains for accomplishing or engaging in assigned activities and punishments for failure to do so. There are a considerable number of researches beari upon rewards and punishments in service situations.

A study in Air Force Technical Schools yielded a list of twenty rewards perceived by one or more students (13). These rewards include such things as pay raises and promotions, pride in workmanship, and desire to please other people. It is probable that much the same set of rewards operate in non-combat on-the-job situations except that group influences assume more importance. Studies by Shaffer (27, p. 1 by Grinker and Spiegel (10), and by Smith (34) indicate that in combat situations, both aerial and ground, the most potent incentive is that of loyalty to one's buddies. In all situations, combat and non-combat, human factors are indicated to be central in job satisfaction and in willingness to strive to do one's best. Material and symbolic rewards are important in training and non-combat activities, but appear to have relatively little significance in keeping men going in combat. An important incentive for Air Force combat crews in instance

where there was a set number of combat missions was that of getting the job done and returning home (24, Vol. II, p. 386). According to Grinker and Spiegel (10), Star (24) and others, ideals or convictions had little motivating force for our soldiers and airmen in combat during World War II. However, the feeling that the conflict is unnecessary, unwarranted, or the result of bungling on the part of political or military leaders was found to have an extremely destructive effect on motivation for military tasks and especially combat tasks.

In most service situations, formal emphasis is more upon punishments than upon rewards. The punishments are well-known; they include demotions, work details, detention, reprimands, dishonorable discharge, and threat of death. Punishments are probably more important in gaining conformance than in creating any real desire to exert one's best effort. Since in service situations conformance is often essential regardless of its personal consequences, punishments cannot be dispensed with. However, it should be recognized that punishments often create unfavorable attitudes, have only temporary effects in bringing about desired behavior, often result in emotional tensions which are not conductive to best effort, and provide little or no positive assistance in the learning of the desired behavior. A study made in November, 1945 showed that only 23 per cent of officers and 20 per cent of enlisted men in the United States thought the best way to get soldiers to behave is to punish; but about half of the officers and two-thirds of the enlisted men thought fear of punishment the main reason for obedience in the Army (24 Vol. I. p. 421).

The actual effectiveness of the formal punishments and rewards in service situations is not known. However, there are reasons

for believing that their effectiveness can be improved. A survey of service men made in 1945 found that more than half of the officers and enlisted men thought promotions were based more upon who you know than what you know (24, Vol. I, p. 421). School officials often complain that students are "appeased," - given grades they want rather than those they deserve (1). Men who have been in combat frequently complain that decorations are not awarded in a just manner. These are only a few of the many evidences that rewards and punishments are not always well administered (24, Vol. II, p. 542). The conditions under which rewards and punishments have greatest effectiveness have been clearly pointed out by Thorndike (17) and by Lewin (25). Justice in their administration is a prime consideration.

(2) Knowledge of the Situation. Johnson (15), in experiments on a wide range of tasks and activities, has shown that positive, unhurried, specific and encouraging types of directions lead to much more accomplishment by children than do negative, general, hurried, and discouraging directions. Uhrbrok (26) found a positive correlation between knowledge about the industrial plant and job satisfaction of clerical workers. These findings tend to support a generally accepted principle of motivation, namely, that motivation is promoted by knowledge of the situation. Insofar as possible, it is generally considered desirable to give men as much information as possible about tasks, means, rewards and punishments.

In training this principle implies, among other things, that motivation may be increased through efforts to orient the students with respect to the nature and objectives of learning activities. It is probably not enough to present the immediate objectives of specific

activities. Immediate tasks have greater meaning when they are seen in relation to other activities inside and beyond the course than when they are viewed in isolation.

Similarly, in job situations, knowledge of how the job relates to the over-all objectives of the services is likely to stimulate effort. Men who cannot see the contribution they are making are not likely to work as hard as those who do. Similarly, men who do not realize the potential rewards for high level achievement or the possible punishments for failure to achieve are not likely to strive as hard as those who do perceive the incentives.

The importance of informing men in combat as to the specific and general nature of the situation has long been recognized. As Marshall (19, p. 175) has said, "What can be successfully willed must first be clearly seen and understood. . . . There is scarcely a commander with any time in combat but has had this experience of having willing troops become suddenly unresponsive because the facts were not straight." Williams and Smith (24, Vol. I, pp.83-84) in a study of the characteristics of ground combat emphasize the "insidious anxieties" which are aroused by the "unceasing confusion." Recognizing that this confusion cannot be entirely eliminated, the point is well made that lack of comprehension of the situation creates stress which tends to reduce the degree of energy which can be directed to the task at hand.

In so far as situations are likely to be anxiety-arousing, it is desirable that individuals to be subjected to these situations be given prior knowledge of what confronts them. Complete psychological preparation for combat is probably not possible (10), but anticipatory treatment of anxieties likely to arise in training and other activities

is possible and should help men to adjust to the stressful situations with which they are forced to deal.

A man cannot obey orders which he does not understand. Clarity in oral and written orders is therefore indispensible if the men are to have the right psychological set. The confusion of regulations--the numbers in which they are issued, the rapidity with which they change, the fact they are overlaid with custom and are often subject to arbitrary decision--this reduces the clarity of the situation and is likely to adversely affect motivation for essential activities (24, Vol. I, pp. 412-413).

Methods of increasing the clarity of goals, tasks, rewards, and punishments can take many forms. A major service program especially concerned with this job is the orientation program. A discussion of this enterprise and its possible values and shortcomings has been presented by Star (24, Vol. I, pp. 430-485). That such a program can be effective if properly conducted is generally accepted. However, the present contribution of the program is not known and should be investigated.

(3) Knowledge of progress. Book and Norwell (3) and Deputy (7) found that groups of college students who were kept informed of their progress did better in learning tasks than did those not informed. A study by Wolff, cited by Harrell (11), indicates improved output in the manufacture of paper as a result of informing workers of their joint production effectiveness. Bray (5) reports a study by Rapparlie who investigated effects of a device for informing gunnery students when they were off target. Use of this device, which gave accruate and specific knowledge of progress, was found to be superior to two types of verbal coaching. Bray also tells of use of a device built by

Ellson to automatically time the speed of solution of gunsighting problems. The device was believed markedly to increase motivation. While these several studies are not designed to hold all other factors constant, they tend to support the generally accepted principle that knowledge of progress of results contributes to motivation. That best evaluation of progress is that which is specific about particular defects, errors, and good points. General, indefinite comments or information are unlikely to have an important influence. These principles would seem to apply to combat situations as well as to non-combat jobs and training tasks.

(4) Success and failure. In a study by Barker, Dembo, and Lewin (2) young children were presented with a frustrating situation. Most children showed a progressive deterioration of behavior which had previously been at a high level. Studies by Cartwright (6) and Gebhard (9) indicate that success in an activity toward which an individual is initially indifferent can result in the development of an intrinsic interest in the activity, and that failure experiences tend to reduce interest and effort. Sears (22) and others have shown that success engenders realistic goal setting which is conductive to further success and a consequent sense of satisfaction in achievement. The effects of the frustrations of battle activity are to decrease willingness for combat (24, Vol. II. pp. 361-373) and to induce anxiety symptoms (24, Vol. II, p. 399). These studies support the principle that, in general, success experiences build motivation and that failure and frustration in difficult tasks destroy it. The implications are that individuals should not be expected to attack tasks in which they have little or no chance of success. An obvious application of this is the

adjustment of training tasks to the level of development of the individ In on-the-job situations, the principle has a similar meaning.

One should not infer that success is always an unmixed blessing. Success may sometimes result in a disarming over-confidence. Marshall (10) points out that in combat, troops who have reached a first objecti "are apt to be pervaded by a sense of extreme well-being and there is apt to ensue laxness in all its forms and with all of its dangers." Over-confidence leads to reduction in effort. Training tasks and on-the-job activities should be sufficiently difficult to present a challenge, yet not so difficult as to create a strong sense of frustrat.

(5) Group Influence. The importance of group loyalty and pressure in combat have already been pointed out. This cannot be over-emphasized. The importance of such sources of motivation underscores the need for close attention to the development of group solid.r in combat units. Personnel policy should be so shaped as to respect the name and tradition of old and honored regiments. Group activity of combat units should not be permitted to greatly slacken off when training has terminated. In continued group activity the men acquire and retain a feeling of mutual dependence which is the heart of group solidarity.

While group solidarity is not so crucial in non-combat as in combat activities, still in groups exhibiting a degree of cohesiveness, its importance for motivation should not be underestimated. In cohesiv groups, the individual is under pressure to conform to the achievement standards of the group. An individual may desire to raise or to lower his level of achievement but may be prevented from doing so by fear of incurring criticism or rejection of buddies whose respect

and acceptance he values. Studies by Lewin (16) and others indicate that where there is a considerable pressure for group conformity, major efforts to change men's motivational levels should be directed toward influencing individuals as members of face-to-face groups. This has important implications for service counseling which now is largely or entirely conducted on an individual basis.

A possible application of our knowledge of group pressures is the use of group rewards and punishments. On the basis of an analysis of comments of officers and enlisted men, Suchman and others (24, Vol. I, pp. 423-429) postulate the conditions under which such an administration of incentives will be effective. This is a promising area for experimental research.

(6) Leadership. The subject of leadership is treated in other reports and therefore will be only briefly touched on here. However, it should be pointed out that in the development and maintenance of motivation, there is no substitute for good leadership. Motivation is not the result of a few simple devices. Our knowledge of motivation at best only suggests some of the general principles underlying the "will to work." Successful application of these principles must be made with shrewd insight on the part of those in positions of leadership. This is true whether the leader be an instructor, a job supervisor or a combat officer.

Research indicates that technical proficiency in a job does not ensure that the individual will be a good leader of others performing the same job. Thus the choice of leaders should not be made solely on the basis of technical proficiency.

(7) Competition. Among the studies of the motivating influence of competition are those of Hurlock (14), Sims (23), and Maller (18). Conclusions of such researches are (a) that competition increases speed of performance and decreases accuracy of quality of work, (b) that individual competition is more effective than competition between groups, and (c) that competition of persons of nearly equal skill has greater effect than that between persons of unequal skill.

In view of these findings and the strong civilian traditions of competition, it is interesting to note that formal competition has not been widely used in the services as a means of stimulating motivation. This may be due to fear of boomerang effects. Where the primary goal is effective cooperative effort, competition is surely undesirable as a training device. Competition fosters an attitude of every-man-for-himself. It may tend to break group unity, and it is likely to lower the morale of those who lose.

(8) Physical conditions. That extremely bad physical conditions over extended periods of time have an adverse effect on morale is certain true. However, within reasonable limits, physical conditions have not been found to be a major determinant of motivation. Stouffer and others (24, Vol. II, pp. 337-361) found the differences in job satisfaction between men in good and poor physical settings to be relatively small. So long as men consider the hardship unavoidable and necessary, they apparently are willing to accept it. On the other hand, intense resentment occurs if the men feel that their discomfort is due to stupidity, inefficiency, or lack of interest on the part of their leaders

(9) Monotony. In a 1947 survey by Fortune magazine, monotony was found to be important in job satisfaction among American factory workers. Other surveys have yielded the same finding. In the military services, an activity in which severe monotony has occurred is practice in radio code. Numerous devices such as rest pauses, increases variety in code learning activitites, and decrease in number of hours of practice per day were effective in combating this monotony. Similar schemes may be expected to have equally beneficial effects in analogous situations.

(10) Motivational Conflict. Conflicts between service duties and other motives or desires reduce the effectiveness of the individual in attacking service tasks. Successful efforts to reduce motivational conflict should therefore result in improved performance on the part of service personnel. Some of the important sources of conflict in military situations have been identified. Hoehn (13) finds that the conflicts in training situations include those in which: (a) individuals are torn between training and non-training activities, (b) the student greatly dislikes the school and the course but strongly desires the rewards which successful participation in them will bring, and (c) the student finds the course distasteful and the rewards meaningless but wishes to avoid the punishments. Grinker and Spiegel (10, p. 14) identify the basic conflict of the air cadet who resists wash-out even when facts strongly indicate its desirability as being "between a passive dependent desire for safety, security and protection, and a desire for the overcompensating role of a heroic aviator." Conflicts in combat situations are likely to be especially strong. Some of the more prominent sources of these are described by

Williams and Brewster (24, Vol. II, p. 77) as (a) "between the requirements of duty and the individual's impulses toward safety and comfort," (b) "between military duty and obligations to family and dependents at home," (c) "between informal group codes, as of loyalty to comrades, and the formal requirements of the military situation.....", and (d) "between previously accepted moral codes and combat imperatives."

The problems of motivational conflict can be dealt with (a) by changing personal values and (b) by inducing new psychological interpretations of tasks that violate values which resist change. Measures helping to solve the problem include indoctrination and counseling. The problem is also partially eliminated by selecting for service only those who are likely to have adequate tolerance for the conflict situations which they will inevitably meet. However, adequate procedures for implementing such selection have not been devised.

4. Appraisal and Summary of Research Data and Principles

a. Summary

(1) Except in the areas of classification and assignment, little research has been made on ways to utilize the motivations which recruits bring with them into service. However, on the basis of the general principles of motivation, it seems desirable to provide recruits with a realistic picture of what they are facing, and to take men's general interests into account in the classification and assignment process.

(2) Research has shown that formal rewards and punishments can be effective in developing and maintaining motivation for specific tasks. The conditions under which they are effective are those in which: (a) the individual correctly perceives the task, (b) the incentives are important in the eyes of the men whose activity they are intended to regulate, (c) the incentives are strong enough to overcome distaste for the task, (d) the individual or group receives the rewards only by successful attack on the task and receives the punishments only when they are justly deserved, (e) the tasks are not so difficult that the chances of their attainment are considered extremely remote. The evidence available indicates that the problem of increasing the effectiveness of rewards and punishments in service situations is not that an insufficient number are used but that they are not always consistently and justly administered. An additional factor which heightens the problem of motivation in the services is the tendency to emphasize punishments rather than rewards.

(3) Informal incentives are probably at least as important in service tasks as formal incentives. The desire for the approval and

respect of one's buddies is a particularly potent incentive, and effort are needed to create those conditions under which this motive can be most fully expressed. The importance of group influences on individ motivation is being increasingly stressed in research on the dynamics of human behavior.

(4) The more information an individual has about his job and how it fits into the total picture, the more likely he is to exhibit strong motivation. Knowledge of the goals, the incentives, and the barriers related to specific tasks or jobs lends meaning to these activities and provides the psychological set necessary for effective attack on the problems to be dealt with. Knowledge of progress is equally important. There is some evidence that this principle is not always adhered to in training situations. Students are frequentl not even given their test scores, much less informed of their specia errors and good points.

(5) The evidence is strong that success tends to stimulate motivation and continued failure to destroy it. An implication in th is that individuals should not be assigned tasks in which they have little chance of success. In training situations, this may be taken into account by individualising instruction or setting up homogeneous classroom groups.

(6) Competition stimulates effort, but its values and bad effects in military situations have not been fully explored. Indivi competition is probably undesirable where cooperative effort is esse Competition between groups may have a less deleterious effect on the development of cooperation but its extensive use does not appear to justified.

(7) Bad physical conditions seem to undermine motivation only when they are extreme, when their eventual termination is not anticipated, or when the men consider the discomfort to be a result of inefficiency or lack of interest on the part of their leaders.

(8) Monotony has clearly been shown to be destructive of motivation. Devices such as rest pauses, variety in activity, and decrease in the number of hours spent in routine operations have been successful in reducing the monotony of many tasks. The problem is in large part solved when personal preferences are taken into account in assignments to routine jobs.

(9) Conflicts of values distract men from their jobs and create anxiety, thus reducing the efficiency of work. Procedures for reducing such conflict include counseling and indoctrination designed to induce new interpretations of conflict situations.

b. Appraisal of methods and results.

As previously indicated, most of the researches on motivation which have been conducted in the military context have utilized questionnaires, interviews, and case studies. These schemes for collection of data have been better suited to the formulation of tentative hypotheses than for the determination of the actual effects of any given factor or set of factors. What is needed at this stage is the design and conduct of experiments to test some of the promising hypotheses already formulated. Only through such research can the chances of successful prediction of the effects of any influence be increased.

It is also significant that most studies of motivation in the service are concerned with job satisfaction rather than willingness

to strive for group goals. While job satisfaction is important, the essential aspect of motivation is the desire to engage effectively in assigned activities. In view of this consideration, a change in the direction of research on morale seems to be called for. A first step in such research is the development of adequate criteria for the striving aspect of motivation.

c. Additional Research Suggested.

(1) The repetition of questionnaire surveys concerned with job satisfaction will probable yield little information not already well established by studies which have been completed or which are now in progress. If such surveys are conducted for research purposes, they should utilize relatively small samples rather than the thousands of cases typical of studies made during World War II.

(2) An important area for research is that of utilizing personal data in classification and assignment. Up to this time the major effort in classification and assignment has been in the development and validation of aptitude tests. A major hope for improving the validity of present procedures lies in the consideration of interests, attitudes, and other personality variables as they relate to training and job success.

(3) Little systematic research has been done in the military on the subject of group influences. Since group standards have been found to exert a strong influence on individual motivation, studies are needed to determine the effectiveness of procedures designed to change group standards. Also, the crucial value of group solidarity in most combat units suggests that investigations be conducted to determine the conditions and devices which foster its

development. Studies of motivation have given major emphasis to an individual approach; the socio-psychological approach should now be given increased attention.

(4) A number of schemes found successful in stimulating maturation in public school and industry have not been widely applied in military settings. Among those which may be suitable to many training situations are the use of homogeneous grouping and the presentation of orientation materials during class time. Those appropriate in non-combat job situations include increased participation of workers in decisions relating to production policies. Studies are needed to determine whether such schemes as these are feasible and fruitful in raising the level of effort among military personnel.

5. Service Policies and Practices to Which Applicable

The principles of motivation are worthy of consideration in the formulation of almost all service policies and practices. However, the policies and practices to which they are most obviously applicable are as follows:

a. Selection, classification and assignment of personnel for the services on the basis of psychological characteristics.

b. Training of personnel for non-combat or combat jobs.

c. Administration of rewards and punishments in military situations.

d. The armed forces orientation program and other indoctrination practices.

e. Planning and carrying out further research studies on factors influencing motivation for required service activities.

6. Recommended Action

a. Service policy and practice.

(1) It is recommended that all practicable steps be taken to improve the administration of rewards and punishments. This includes among other things, the adoption of better methods of determining who should be promoted, and increased efforts to see that decorations go to those who deserve them. It is also recommended that greater relative emphasis be placed on rewards than is now the case (par 3d(1)).

(2) It is recommended that training be as typical as possible of job situations. Realistic training provides men with complete information about their jobs and adds meaning to training tasks (par 3d(2)).

(3) It is recommended that there be extensive orientation in all phases of activity in basic, technical, and combat training, and in job situations. The subjects covered should be decided according to the needs of specific groups. They might include the ways particular jobs fit into the over-all pattern of the military mission, overviews of courses, identifications of and stress on rewards and punishments, and anticipatory treatment of anxieties (par 3d(2)).

(4) It is recommended that the importance of group solidarity in combat units be respected to the greatest possible degree. In combat, no other motivating factor plays so important a role as loyalty to one's buddies (par 3d(5)).

(5) It is recommended that leadership training place heavy stress upon human relations problems. The quality of human relations is a central factor in motivation in all jobs, and no one has so great an influence over human relations as those in positions of authority (par 3d(6)).

(3) It is recommended that men's general interests be considered in initial and subsequent assignment. An attempt is made to do this at the present time, but the effort is hampered by strict quotas and lack of sufficient trained counseling personnel. At present, there are no standard procedures for considering men's interests in assignments other than initial assignments. Policies and practices relative to considering men's interests in subsequent assignments should be established. Not all men can be placed in the area of their general interests, but such interests frequently indicate the types of jobs in which men will be willing to exert the greatest effort (par 3d(3)).

(7) It is recommended that in training and job activities, and wherever possible, in combat, men be informed of their progress and of their level of accomplishment. Such information should be specific with respect to good and bad points, correct responses and erroneous ones (par 3d(3)).

(8) It is recommended that group counseling be used in place of, or as a supplement to, individual counseling where the men involved are members of an intimate face-to-face group. Group counseling takes into account the importance of group influences in the determination of individual motivation (par 3d(5)).

b. Additional Research

Additional research in the following areas is recommended:

(1) Studies to determine factors of background, training, experience, and general interests which are related to satisfaction in and motivation for various kinds of jobs (par 3d(3)).

(2) Development of adequate criteria of motivation. Research of this nature is needed before experimental studies of factors affecting

motivation can be made (par 4b).

(3) Evaluation of the effects which orientation programs of various kinds have upon motivation (par 3d(2)).

(4) the feasibility and effect of men's participation in discussion and decisions relative to production policies and methods. Obviously, this research would have to be restricted to certain types of training and non-combat job situations (par 3d(5)).

(5) The effectiveness of group rewards and punishments (par 3d(5)).

(6) The factors in leadership related to ability to adequately manage human relationships. Also, studies of factors of background, training, and experience related to this ability (par 3d(6)).

(7) In training situations, studies should be made of the effects of (a) various test critique procedures, (b) various quiz arrangements, (c) homogeneous grouping, (d) individualize instruction, and (e) supervised study (par 3d(3) and (4)).

(8) Studies of factors conductive to the development of group solidarity in combat units (par 3d(5)).

In the preparation of this report reference was made to the following sources, which are indicated by number in the report.

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TRAINING EMPHASIS ON DIFFICULT COMPONENTS OF TOTAL TASK

Human Resources Research Center

Prepared for

THE WORKING GROUP ON HUMAN BEHAVIOR
UNDER CONDITIONS OF MILITARY SERVICE

Department of Defense
Research and Development Board
Washington 25, D. C.

June 30, 1951

TRAINING EMPHASIS ON DIFFICULT COMPONENTS OF TOTAL TASK

Human Resources Research Center

1. Problem: Present procedures in the training of jobs involving motor skills appear in many instances to neglect putting emphasis on critical or difficult aspects of the job. Some research has suggested that special training emphasis on difficult components of a total task may increase the efficiency of training over the procedure of giving only training on the total task.

Research Results: (a) ONR Special Devices Center Report 316-1-1 December 1947, "Transfer of Training from Practice Components in a Motor Skill."

(b) ONR Special Devices Center Report 316-1-9, 12 August 1949, "The Effects of an Interfering Task on the Learning of a Complex Motor Skill."

Solution:

Action by Research Agency: Conduct research to determine transfer of training between practice on critical task components and total task, with systematic variations in task characteristics to reveal generality of results obtained.

Action by Administrative Agency: Make an analysis of existing training procedures for motor skills such as radar operation, bulldozer operation, typewriting, code reception. Examine the possibility of revising curricu

to give special emphasis to difficult components of the jobs being learned. Such revision can be made with greater degree of success following the obtaining of research results.

TRAINING OF JET FIGHTER PILOTS

Human Resources Research Center

Prepared for

THE WORKING GROUP ON HUMAN BEHAVIOR
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TRAINING OF JET FIGHTER PILOTS

Human Resources Research Center

Problem:

Considerable time and money are expended by the Air Force in training jet fighter pilots utilizing the media of the T-6, the T-28, and finally the T-33 type aircraft. In view of the specialized nature of jet fighter flying and the present day need on the part of operational organizations for specifically trained replacements rather than for replacements with a liberal education in flying, it is believed that exploration of the feasibility of beginning the training of jet fighter pilots in the T-33 or other tandem jet trainers is in order. The question of a desirable degree of flexibility insofar as the flying of different types of aircraft is concerned, particularly after the specialized training in jet fighters, does not pose an insurmountable problem. On a number of occasions during World War II combat battered aircraft returned to their bases with only a crew chief at the controls.

Research References:

The success with which the North American T-6 has been used as a basic trainer points the way for the recommended action. As recently as 1940, only ten years ago, it was believed that this aircraft was an advanced trainer in the strictest sense of the word. Today it is the combination primary - basic trainer through the medium of which the Air Force is training its Aviation Cadets. It is indicated that basic training and early specialization in jet fighters will result in an expedited

training program with concomitant economies.

Solution:

Action by Research Agency:

The preparation of an experimental syllabus, after comprehensive exploration of the on-the-job operational performance expected of newly graduated pilots, the formulation of suitable proficiency measures, and suitable training of instructors constitute the basic a... required of the Directorate of Pilot Training Research.

Action by Administrative Agency:

Recognition of the advantages of a streamlined, specialized course of flying training to begin in the T-33 or any other suitable tandem je trainer. The authorization of higher headquarters for Directorate of Pilot Training to begin work in this area immediately.

RESEARCH ON COMBAT BEHAVIOR

Panel of Expert Cohsultants
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Alabama

Prepared for
THE WORKING GROUP ON HUMAN BEHAVIOR
UNDER CONDITIONS OF MILITARY SERVICE

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June 30, 1951

RESEARCH ON COMBAT BEHAVIOR

-PANEL OF EXPERT CONSULTANTS-

HUMAN RESOURCES RESEARCH INSTITUTE

AIR UNIVERSITY

INTRODUCTION

The HRRI has an opportunity to profit by the experience of research undertaken in World War II on this problem and to plan now for a systematic research program, with the validation to come in Korea or in wider areas of conflict if general war comes.

At the same time, there is need for help on a variety of important problems, although no really satisfactory solutions may be forthcoming unless a long-range program of basic research is undertaken.

Research proposals are discussed under four main heads:

A. An actuarial study of social and psychological factors discriminating effective from ineffective combat crews.

B. An immediate study of combat behavior in the Korean war, by analysts to be sent to Japan.

C. Differential reactions to stressful situations. (Other research on (1) lone missions vs. mass formation; (2) continuity of stress, length of combat tours, rest periods, etc; (3) combat briefing.)

D. Basic long-range research on fear and its control.

A. An Actuarial Study of Social and Psychological Factors Discriminating Effective from Ineffective Combat Crews

Such a study was designed by the Research Branch, I & E Division, War Department, in 1945. (See American Soldier, Vol II, p. 30.) The ZI phase was completed, involving administering an elaborate attitude questionnaire to all officers and enlisted men in a B-29 bombardment wing. With the cooperation of the Command and of the Air Surgeon, record forms were prepared to enter data on the combat performance of every sortie including data on individual crew members where relevant. Plans also were approved to give another attitude survey to the entire wing after the 15th mission. An experienced research officer was sent to the Pacific to live with the outfit and to supervise the record taking. However, the war ended upon the arrival of the wing at Okinawa. The plans and preliminary analyses of this study are in the files of the Troop Attitudes Branch in Washington.

It should be mentioned that the questionnaire actually administered was prepared after studying the experiences and reports of several thousand flying officers and airmen who had returned to ZI after completing tours of duty in Europe or the Pacific. It represented the best the Research Branch knew how to do at the time and the design of the larger project was the outcome of many conferences with higher commanders. The study director of this project, Dr. Robert N. Ford, is now a research analyst with A.T. & T. It would be highly desirable to bring him to Montgomery for a short period to discuss with him the details of that study and to utilize his experience in devising a new

study (which might be different in various respects because of changed conditions).

If a full-dress program could be introduced now in a Wing schedule for early departure for the Pacific, the results might be far reaching in putting attitude research on combat behavior on an actuarial basis. Ideally, it would be well to couple with the statistical study a clinical analysis and a general structural analysis of the combat situation. Thus a team comprising a social psychologist statistician, a clincal psychologist, and a sociologist or social anthropologist might be attached to the Wing.

This project, to succeed, would have to be "sold" up and down the Command and the support of the Air Surgeon secured. It has the highest promise of paying quick dividends and laying the basis for very long-range research relevant to all HRRI work on combat.

B. An Immediate Study of Combat Behavior in the Korean War

Without awaiting the outcome of the systematic project designed above, there could be some extremely useful spot research in Japan now if HRRI had one or more very skilful research analysts there.

This would involve a study of the human factors related to aborts on Korean missions, based on on-the-spot interviews with bomber crew members or fighter pilots, together with the records. This might lead to a comparative study with aborts and performance in training.

A special problem which should be investigated in Japan is the extent to which aborts or other evidences of inadequate performance are related to the presence or absence of family members in Japan. Some case studies throwing light on the psychological tension involved by the presence of the family members would also be useful.

C. Differential Reactions to Stressful Situations (Other Research

While the research A is specifically designed to get at individual differences and team differences under stress, there are certain specialized problems which can be studied in training situations and which may call for basic research best carried out at universities.

1. Lone missions vs. mass formations. The importance of the selection of highly qualified crews for lone missions needs no elaboration. Experience of the last war seemed to teach the power of the example of companions in enabling one to face extreme stress without turning back. Perhaps some individuals require such an example, others will function in its absence. How this variable can be isolated and measured in situational tests in training, along with all the others involved in selection of special crews is a problem which looks tough to solve, but is so highly important that it is worth a research try, if a really top psychologist can be put to work on it.

2. Continuity of stress, length of combat tours, rest periods, etc. The literature from World War II on this subject should be intensively reviewed. SAC, because of its mission in AF, has operated under psychological wartime conditions at least ever since the close of World War II. Combat crews have constantly had to live under the expectation of having to leave on a mission. As a result of this situation, the question arises as to how long one can expect a crew to be keyed up to combat pitch before a general and dangerous slump-off in experience in interest and efficiency. The problem is analogous, of course, to the condition of a fighter being trained for a match which is always cancelled just as

he climbs in the ring. With the general war situation developing as it is, it is possible that this problem will not be as acute as in the past. Similar problems throughout the entire Air Force which occur in connection with missions being "scrubbed" will, of course, be quite general in case of an all out effort, and the problem of length of tours of duty, spacing of rest periods, etc., will be vital. What opportunities for actual research in this problem exist, we do not know. Only after making a preliminary study of the literature and an incisive analysis of the probable relevant variables, would we be in a position to judge whether some experimental research might profitably be undertaken.

3. Combat briefing. During World War II considerable variance existed in combat crew briefings. Procedures were more or less standard; that is, the order of presentation by the Operations Officer, Weather Officer, Intelligence Officer, etc. What might be termed the "psychological approach," however, was where the differences existed. Some briefings very frankly pointed out the extreme dangers involved in the mission at hand. Others attempted to soft pedal the actual dangers; while still others emphasized the great importance of the mission to the overall war effort. An extreme example of poor briefing (which was quoted by Colonel Lyle as an actual fact) was a case in the Eighth Air Force when the crews had gathered for briefing on an unusually hazardous mission. The Commanding Officer stepped up and pulled the cord which drew back the black curtains from the mission map. The target was one which caused a great hush to fall over the assembled crews. At the moment the Chaplain, feeling he should do something to

ease the tension, said, "Let us pray." Needless to say, that was not the best psychological approach for the occasion. There appears to be, therefore, a needed field for research into just what is the most desirable combat crew briefing technique from the psychological standpoint. It is believed that this research problem will receive very favorable attention from Air Force authorities.

Perhaps the starting point of research here would be to collect records of experience from veterans of air combat, perhaps asking them to describe in detail a briefing situation where a stressful prospect was skillfully handled in briefing and, by contrast, a situation where such a prospect was unskillfully handled. These experiences could be written out, just like the experiences in the Ethics study. Where research could go beyond an analysis of such stories is not now clear. The warning should be issued that basic psychological theory may have as yet little to contribute. How far HRRI should go in supporting relevant basic psychological studies may be debatable. But there is a broad area which needs to be worked on by somebody at universities and is described in the next section.

D. Long Range Research on Basic Fear and Its Control

In spite of the fact that some of the hardest effort in the Research Branch was devoted to research on fear, all who worked on the problem in a military setting felt that a ceiling was soon reached in effective study because of the absence of suitable criteria for measuring fear symptoms. The American Soldier, Vol II, Chapter 4, "Problems Related to the Control of Fear in Combat," by Irving L. Janis analyzes the research findings and makes such observations as the following (pp. 193-5):

> "Social science...research aims at establishing general hypotheses on the conditions under which fear reactions are elicited, augmented, and diminished - hypotheses which would provide the framework for a systematic theory of the social psychology of fear.
>
> "If such a scientific framework had been developed before the war, it would undoubtedly have permitted important practical applications throughout the Army by facilitating research on major problems of fear control....
>
> "In spite of the critical need for answers,...very little fundamental research was carried out. In large part, the absence of basic research in this field both before and during the war is attributable to a key methodological problem which remains to be solved before it will be possible to carry out well-controlled studies of variables related to disruptive fear reactions - the problem of developing valid criteria of maladaptive fear responses in the form of indices which can be practically applied in social science research....
>
> "From the point of view of military control of fear it is the maladaptive type of reaction which is of primary interest - preventing the occurrence of involuntary stupid acts (or failure to act) which increases the danger to the military unit.
>
> "Criteria need to be developed...also for evaluating the after effects of a given exposure to danger. In the military context, one of the major types of problems in fear control is to determine whether exposure to sample danger situations during the training period would have a beneficial effect with respect to preparing the men to face danger situations in combat. To deal with this type of practical problem requires an evaluation of the after effects of a given type of fear experience. On the one hand, the

elicitation of fear in a training situation may have beneficial phobic type of reaction toward combat may develop which might interfere with training and motivate the men to avoid combat duty. In addition to effects upon motivation, it is necessary to take account of the direct effect of experiences in training in terms of: adaptation to fear-eliciting stimuli, which would tend to reduce the intensity of fear reactions; and sensitization, which would tend to increase the intensity of fear reactions to future exposures.

"If sound criteria of maladaptive fear reactions had been available, military psychologists would have been in a position to carry out extensive experiments on the effectiveness of various training activities and personnel policies devised to reduce fear in danger situations."

HRRI has an obligation to initiate a basic research program, some of which might be carried out through university contracts, to help close the gaps on this subject. A first step would be to bring together a small number of top level people to think over the research needs. As the result of such a research conference, a planned attack on this problem could be set up, perhaps in cooperation with the Air Surgeon. But the program ought not to be in the control of psychiatrists, however able. The basic research which is now most needed is likely to come primarily from the social psychologists familiar with learning theory and skilled in the development of new techniques of measurement as well as of ingenious experimental designs.

It is only after more such basic research that any really satisfactory procedures for dealing theoretically and practically with the urgent problem discussed under C above (Differential Reactions to Stressful Situations) can be formulated. However, pending the long time one must wait for solutions under D, there no doubt is an obligation to do the best one can for C along the lines there suggested.

RESEARCH OF THE MILITARY COMMUNITY

Panel of Expert Consultants
Human Resources Research Institute
Air University

Prepared for
THE WORKING GROUP ON HUMAN BEHAVIOR
UNDER CONDITIONS OF MILITARY SERVICE

Department of Defense
Research and Development Board
Washington 25, D. C.

June 30, 1951

RESEARCH ON THE MILITARY COMMUNITY

Panel of Expert Consultants
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Objectives:

To use human resources more effectively, military management must take account of the total situations in which Air Force systems and procedures operate. Good management must also understand officers and airmen as whole persons whose lives off the job and out of uniform are because and effect of their behavior as soldiers. These basic requirements of good management call for the kinds of study catalogued here as a major division of management research, "research on the military community."

As in other fields of scientific inquiry, it is necessary in human relations to break down general phenomena to their specifics, and to fraction out the parts of a whole. At the same time we must always see the particulars in relation one to the other and as parts of a whole. Common sense likewise tells us to "look for the whole story," "see the big picutres." Such are the major objectives of the research proposed here.

We will deal with the wing base as a primary total situation; and with certain commonly neglected situations involving other armed services and foreign civilians. Other proposals call for investigation of family problems, inter-racial relations, and leisure time behavior; all relate to the consideration of the military man as a whole person. By research on "the military community" then, we mean inquiries like these which emphasize the situational basis or context of all management and moral

problems, or which deal with those facets of military life that are commonly regarded as outside the realm of the purely military but which are in fact extremely important to it.

Lines of Attack:

Nine research proposals have been outlined.

(1) Wing Base Leadership and the Social Structure.

(2) Behavior Standards.

(3) Comparative Leadership Situations.

(4) Non-Military Factors in Productivity.

(5) The Fighting Man's Family Attitudes and His Combat Behavior.

(6) The Problems of Residential Instability.

(7) Negro-White Relations in the Air Force.

(8) Utilization of Leisure.

(9) The Quality of Air Force Guidance and Counselling.

They represent the kinds of investigation that ought to be made in the field of the military community. It should be noted, however, that the problems and approaches listed are illustrative rather than exhaustive and though all of them are of practical importance to the Air Force, some deserve a higher priority than others, especially in an emergency period.

Three of the research briefs deal with the larger situations of Air Force management and leadership: (1) Wing-Base Leadership and the Social Structure, (2) Behavior Standards, and (3) Comparative Leadership Situations. In the first, emphasis is given to understanding of the interlocking but variant systems of official and unofficial systems of leadership, power, and influence as a means of designing more realistic

administrative procedures which will coordinate the dual leadership structures. The base is taken as the situational unit. In the second, emphasis is on the absence of widely recognized standards and norms which would give greater regularity and consistency to the behavior of Air Force personnel, and thus at the same time facilitate a more highly integrated and efficient military organization. Such standards are social in essence. They are socially originated, socially shared, and socially learned. They are the normative and "moral" component of all management situations. The third proposal simply calls attention to certain kinds of situations that are peripheral to most Air Force management problems, but which nevertheless are crucially important in many connections; environmental extremes; USAF-Army, USAF-Navy situations; USAF-RAAF and other allied military forces; as well as USAF and foreign civilian situations.

The second set of illustrative statements refer to non-military factors deserving explicit attention in relation to the soldier as a human being and correspondingly, to military proficiency: (4) Non-Military Factors in Productivity, (5) The Fighting Man's Family Attitude and His Combat Behavior, and (6) The Problems of Residential Instability. The first brief is a generalized statement plus a more focused suggestion referring to marital and family problems. The second and third briefs also deal with matters of family - job relations -- change in place of residence, and the social psychological problems of combat flying from the base at which one's family is also resident, as in Japan now or in the U.S. in the event of domestic-based combat operations. Also dealing with non-military matters of

military importance are two other proposals whose titles are self-explanatory: (7) Negro-White Relations in the Air Force, and (8) Utilisation of Leisure.

The last proposal — (9) The Quality of Air Force Guidance and Counselling — calls for an appraisal of the need for counselling service and of the machinery that now exists. This proposal looks toward the development of an improved counselling service not only as a personal adjustment aid, but also as an adjunct of military management and human relations research.

In none of the statements have matters of research design or methodology received more than the barest consideration. At the same time some attempt has been made to cite "researchable" approaches to the problems, and certain suggestions are made regarding techniques.

Importance:

A rough and tentative priority listing of the nine proposals, viewed in terms of USAF needs as we see them, is as follows:

(1) Negro-White Relations in the Air Force.

(2) Comparative Leadership Situations.

(3) Wing-Base Leadership and the Social Structure.

(4) The Fighting Man's Family Attitudes Related to His Combat Behavior.

(5) Residential Instability.

(6) Non-Military Factors in Productivity (The Family).

(7) Behavior Standards.

(8) The Quality of Air Force Guidance and Counselling.

(9) Utilization of Leisure.

(1) Wing-Base Leadership and Social Structure

The formal leadership structure of a Base is well defined by regulation and tradition. However, this is not identical with the actual power and influence structure of the Base. We need to know much more than we do about how a base actually gets its work accomplished, who really "calls the shots" at various levels of authority what compromises with the formal structure are necessary, and what centers of influence exist. With such knowledge we will then be in a position to determine (a) how formal leadership can profitably reorganize and use informal leadership; and (b) recognize and cope with those conditions which pose serious threats to the formal, official structure.

A study needs to be made of the influence patterns within squadrons, between squadrons in a group, and between groups in a wing Such patterns should be related to situational factors such as mission mission frustration, reorganizations, etc. The relationship between the informal and formal structure should then be studied to determine organizational tolerance to dual leadership structures and the effect of such dualism on operational proficiency. The practical objectives (and they are very important) would be leadership techniques for realistically utilizing influence patterns, and administrative procedures for determining when formal leadership has no lost control as to warrant reorganization in order to accomplish the mission.

(2) Behavior Standards

Our behavior is largely determined by what we think others will think of our actions. Dollard's finding that regard for the good opinion of one's fellows is a strong motivational factor in making men fight is a case in point. From this it follows that organizations depend heavily on consensus as to what is esteemed and disesteemed, which actions are favored and which are frowned upon. Where such consensus is little or lacking, the organization is weakened and perhaps seriously threatened. There is reason to believe this is a fundamental problem of the USAF.

In addition to undergoing the upheaval experienced by all three services in the last decade due to the influx of civilian influence, the USAF had to disgorge itself from the womb of its parent, the U.S. Army, and be born! And the birth was not unlike one that occurred in a taxicab on the way to the hospital, for it came about in swiftly-moving times.....times during which reflection did not characterize many decisions made in the military.

So the dutiful child, not too certain about many things, fell hesitantly into the cadence of those who had gone before. There hardly was time to stop and examine oneself and to ask the question: "Should I just take for myself all of these things without question?" But lack of time to reflect on such a question did not eliminate the need for its being asked. Widespread evidence of confusion and misunderstanding about standards of behavior on the part of many officers began to appear.

In fact a serious concern over the deviant behavior of many officers led high Air Force officials to ask for a study that would eventually yield a code of professional ethics for Air Force officers (the "Ethic project").

An investigation was made accordingly and two major conclusions were reached:

1. There are many differences between the implicit standards of behavior existing in the USAF and those which existed in the pre-war army.
2. There is a strong need for "spelling out" just what the implicit standards are.

The problem, then, may be stated as follows:

1. What are the existing standards of behavior in the USAF?
2. Do they differ from traditional military standards? If so, how are they different?
3. How well are they understood by Air Force personnel?
4. In what ways can increased understanding among Air Force personnel be brought about relative to standards of behavior?

Research could be pursued along lines indicated by several of the ethical themes that evolved from the Ethics project, for example,

"The Effect of Misuse of Position and/or Authority on Productivity."

(3) Comparative Leadership Situations

Leadership is always shaped and limited by its natural setting and social situation, and the best systems and procedures will not work equally well under all conditions. This is inevitably the case in all large and complex organizations like the Air Force. It is likewise a fact of concern to practically all of human relations research in the Air Force. There is, therefore, no point in trying to set up a particular research program aimed at such general phenomena. At the same time, however, there are certain settings and situations which tend to be neglected or treated as peripheral though they may be of curcial importance for many purposes. To these we would direct attention, namely, AF leadership and organization in

1. The extreme natural setting and social situation — as with isolated Shoran and Loran field stations, arctic and tropical bases.
2. The foreign civilian situation — Japan, Korea, Philippines, the North Atlantic Pact countries, etc.
3. Collaborative situations with the foreign military, including UN auspices.
4. Collaborative situations with the U.S. Navy and Marines, and Ground Forces.

A first task here would be to identify precisely in terms of USAF organization and formal assignment those leadership situations which would fall under the four categories cited. Next a sharper classification or mapping along sociological lines should be done, followed by a priority ranking in accordance with the military missions which they serve. Certain situations can then be selected for further exploration or "casing," and 100

or so intensive interviews run with experienced officers and airmen. Co able interviews should also be made of other Americans who have operated similar situations outside the military; business executives, salesmen, technicians, and civilian agency administrators. Cultural surveys, including some of the studies of national character might also offer valuat information, along with salient attitude and opinion surveys conducted in Germany and perhaps elsewhere, and social psychological studies of extre isolation. On the basis of such exploratory research, more exact and penetrating studies may be set up.

The end-product of this research should be a fund of military leader ship and management-oriented knowledge broken down according to type situations of strategic importance, and taking full account of such fact in these situations as the following:

(1) Typical mistakes and miscues attributable to erroneous assess of -

(2) The expectations (goals, hopes, fears) of others

(3) The customs and cultural traditions of other groups

(4) "Adaptive" solutions of leadership problems in these situation.

Such knowledge should then be built into officer training courses and re istic manuals or better perhaps, the briefing for specific assignments i situations like those studied.

The small group, psycho-social, domension is especially important. Our knowledge should not be limited to the cultural aspect. The pattern leadership behavior which can be employed by either a designated leader group-elected leader are dependent upon the attitudes and expectations o persons in the group - the followers and the leader. Leadership behavio thus a function of the patterns of interaction wich the leader and the

members have in common - and is particularly dependent upon the patterns of interaction which the members who are to be followers are willing to accept in different social situations. These attitudes, role expectations, and customary patterns of interaction which the leader and members bring to the situation are in turn dependent upon the social norms and traditions of the class, society, or culture of which each person is a part. The level of effectiveness of group activity is dependent upon the congruence of reciprocal role expectations among members and leaders.

(4) Non-Military Factors in Productivity (The Family)

Civilian organizations have learned to their advantage that the off job situations of their workers are extremely important determinants of on-the-job performance. Perhaps because the military ostensibly has more complete and more powerful controls over the individual's work, or because it was assumed the soldier would somehow willingly give enough to the military job, off-job conditions have received little serious and sustained attention by those concerned with military effectiveness. Now, however, with more compelling demands on the individual as an individual, and less justified dependence on quantity manpower regardless of quality (and more these considerations - considerations of total situations and the whole person become crucial. Especially is this true of the Air Force with its complex instruments of war and the highly specialized activities and jobs associated therewith.

It is not easy to define the "non-military" factors of productivity In a very real sense there are no factors which, strictly speaking, are non-military. Military bases are much more inclusive and enveloping life situations than are civilian communities. Men in uniform probably share broader base of common experience, common stakes and interests than other occupational groups. Similar is the case of their wives and children. Military command is also more nearly complete and the individual's freedom of choice and movement more circumscribed. Nevertheless, we know the soldier, airman and officer "buttons his pants like anybody else." That is to say, he is a human being.

If follows from this that whereas maximum military efficiency is the prime objective of the Air Force as an institution or organization, pers

and family well-being are the human objectives, broadly stated, of Air Force personnel. An important question is, therefore, to what extend and in what ways does the community situation and the broader setting shape and affect military performance? How do the climate of public opinion and generalized customs in the nation, the region or the city near a base; family and personal life; and informal cliques not prescribed by formal military relationships impede or facilitate achievement of military objectives and human objectives? How can the satisfactions of off-the-job, non-military, or extra-military — whatever the term — situations build rather than block effective military performance?

We have here an extensive problem area rather than a neatly circumscribed research project. Only preliminary survey of the broad field can indicate the more promising and strategic points at which to bore in. Until this is done, researchable problems that are also of high priority will not be isolated, and the area will not be broken down. One sector which will probably loom highly important, however, is that of marriage and family.

Materials should include representative family hisotries and intensive interviews, group and individual with both wives and husbands. Official AF statistics on marriage, separation, and divorce should be analysed for such factors, as for example in divorce, as change of duty station, age and grade, size of family. The problem of interlocking, complementary and often conflicting roles of Air Force personnel, their wives, and children should be defined and differentiated by type situations; structured according to kind of duty, residence arrangement, income, education, marital status, family composition, wartime or peacetime. Measures of family morale which take account of wives' and husbands' attitudes might be developed and employed

jointly with measures of job and unit proficiency. The "livability" the Air Force and Air Force communities as viewed by military perso their families could thus be scrutinized, and unnecessary sources of frustration and tension between the "whole man" and the "military mar identified. In addition to the problems of residential instability : combat flying from bases on which one's family is resident outlined : statements, there are also such family centered problems as the fo crisis and transition adjustments of the military family, the high d rate (?) in SAC, adjustments to prolonged separation, special pro child and "teen-age" development attributable to the father's milita occupation, special problems of hazardous duty and war-time emergenc wife's role in her husband's military advancement and promotion.

Other sectors of non-military life and community organization r be analyzed as a basis for more effective military management. The is by no means the only non-military aspect of military life. Inter- relations, and the utilisation of leisure, elsewhere outlined, are m two of many possibilities for fruitful social research.

(5) The Fighting Man's Family Attitudes and His Combat Behavior

Air Force personnel have different prescribed roles and responsibilities according to the different groups to which they belong. The two psychologically most important groups in which the officer and airman has simultaneous memberships are his fighting unit and his family. Memberships in groups making contrasting demands on the individual, such as these two kinds of groups commonly do, may or may not lead to personal maladjustment, depending on how the military individual and his immediate family perceive their relationships to each other and the relationship of their family unit to society at large.

Because of the conflicting role prescriptions that the fighting unit and the family make on the military man, the fighting man is usually not allowed to have his family with him. There is, however, an exception to this today in the war in the Far East. Airmen who have had their families with them for the Japanese occupation are now being called upon to fight. Some are fighting from home bases on which their families are living, and thus we have a "critical experiment" which ought to be investigated in connection with other Korean campaign experiences.

Suggested immediate implementation:

A social psychological study of (a) the role demands made by the fighting unit and the family on airmen living with their families in Japan and those without their immediate families on the base, and

(b) the adjustment mechanisms used by airmen to resolve these diffe role demands when they are perceived as in conflict. Is it "better for the combat flyer to have his family in Japan or at home? Ar their differences in fighting proficiency (as measured by aborts an completions) attributable to the family situation? What release mechanisms are utilized, and what adjustments are sought in this fi situation? These questions are important not only to military man ment in Japan but elsewhere, including the U.S. if we ever fly cor from domestic bases.

(6) The Problems of Residential Instability

The movement of personnel, a necessity of all organizations, is especially characteristic of military organizations. And one may reasonably expect more movement in the Air Force than in civilian corporations or government agencies as a whole. The problem for the Air Force arises principally from two facts: (1) movement entails instability of residence and, correspondingly, instability of military communities; and (2) instability tends to create difficulties of inter-personal adjustment, motivation, organization, and military efficiency.

One hears complaints on all sides about unnecessary moves, expensive moves, moves the wife doesn't like, moves that are hard on the children, moves which break up friendships, moves which keep squadrons and crews inefficient moves and too many moves. There are also those who like their moves — "see new places," "meet new people," "it makes the kids learn faster and make friends better," "this base is sure better than the last," etc. A subject cussed and discussed as much as movement and instability of residence surely deserves careful investigation by the student of military management.

The prime questions to be answered are these: (1) How and to what extent does residential instability affect military morale? (2) How much personnel movement is unjustified in the light of morale costs and military effectiveness? (3) How may residence and the military community be made more nearly stable and still serve the overall organizational needs of the Air Force?

In designing the studies, questionnaires and interviews in this area, certain elementary distinctions should be borne in mind. Physical movement does not always involve change in residence (if residence be defined roughly as the relatively permanent place of rest and locus of most personal belongings and activities). Nor does change in residence necessarily involve change in community (new quarters may be occupied on the same base, for example). For purposes of social psychological analysis, of course, we must distinguish and relate three fundamental dimensions of movement and instability; the physical (physical space), the societal (social space), the psychological (the psychological "field"). Our inquiries should establish the relations between all three of these, and the effects of instability on group motivation and morale.

For management purposes we should also know the "patterns" of instability and reaction thereto by command and type of duty, in peace and in war, and by type of man and life situation -- education, rank, age, length of service, previous moves, and especially important, family status (single or married, and if married, number and ages of children). It may be that certain underlying "pro -" or anti -move" attitudes exist and the Air Force, other things being equal, as a matter of personnel policy should keep the "itchy feet" on the move, and the "stay at homes" in one place. The ways of circumventing, the evasions and "protective" devices which men and group develop, in reaction to instability and movement also merit careful study. SAC might well receive first attention.

(7) Negro-White Relations in the Air Force

Any concern with the all-out organization and efficiency of human resources in the Air Force, or with the mobilization of military manpower in the nation, eventually leads into the problems of race and minorities, especially as they involve the Negro. The President's directive on racial integration, its implementation and its consequences, lends still greater importance to the study of Negroes in uniform. Broadly speaking, the Air Force problem is how to motivate Negro personnel and assimilate them in a bi-racial organization of maximum fighting efficiency. Both aspects of this problem, of course, involve white attitudes and action no less than Negro. The position of the Negro has changed and will continue to change in the Air Force as well as in the nation. By the same token race relations are also changing. High tension incidents and low morale areas are bound to develop in the path of such change. Whites no less than Negroes are affected. With expansion of the Air Force, moreover, new and greater problems of interracial adjustments will arise. Sound management policy here must surely be based on definitive and continuous knowledge of Negro-White attitudes and behavior.

That the course of "integration" is not smooth, despite the President's directive, is clearly evident. At some bases one sees only the barest token compliance. At others both officers and airmen speak with pride of the job they have done. There are all kinds of discrepancies in the degree of integration and the kinds of situations which are more or less bi-racial -- housing, messing, use of clubs, dances, swimming,

command, skilled work, etc. Some Negroes thought Utopia was just around the corner and feel cheated because things have changed less than they hoped for. Others feel "integration" is entirely hollow or a cheap political gag. The whole range of variant aspirations, reactions, prejudices, and deprivations among whites and Negroes calls for study.

We should know how far integration has proceeded in identifiable types of situations where Negroes and whites are involved. We should know, correspondlingly, how the position of the Negro has changed in both psychological and social aspects. Also we should understand the circumstances and mechanisms of these changes. To get at the administrative devices and other conditions of successful integration, we should carefully analyse cases of success and failure. Thus we can learn how and how not to handle these and similar situations. Especially important matters for research are the unplanned and unexpected consequences of social changes, consequences for Negroes, whites, and the military organisation as a whole. With such knowledge in hand and kept current as long as Air Force race relations are in critical flux, humane and wise management policies can best be developed, and informed practices made more the rule than the exception.

(8) Utilization of Leisure

Inequalities of access to leisure facilities and activities, as between the permanent party and transients, officers and airmen, different squadrons on the same base, different bases, etc., may create serious morale problems. The sheer absence of facilities for healthful and recreative use of leisure time may also be reflected in high venereal disease, and off base accidents. Thus leisure-time behavior and the attitudes linked thereto constitute an important dimension of military life. The attitude concept is especially important here, for the mere enumerating of ball bats, swimming pools, clubs and hobby shops does not take us very far toward solving the human problems. To put leisure behavior in a realistic morale and management context we must look for feelings of deprivation and satisfaction, game esprit and military efficiency.

With the approach outlined above, research might well be used as a basis of standard rating scales for determining the adequacy of leisure time facilities. Such scales should enable us to rate objectively the amount and quality of swimming pools, gymnasiums, tennis courts, hobby shops, libraries, clubs and other facilities according to the needs of men at various kinds of bases in various community situations. Time budgets of leisure behavior may be a useful technique. A comparison of two bases, comparable in all respects except leisure facilities, might be useful in assessing the real value of certain leisure facilities, though the methodological problems here are very great.

Problems of leisure behavior should have relatively high priority in those organizations which show high absenteeism, V.D., and off-base accident rates. Situational factors in V.D. control is in itself a problem of magnitude. Why some programs are successful and some are not demands social psychological inquiry and gets, inevitably, into problems of leisure utilization.

(9) The Quality of Air Force Guidance and Counselling Services

The Air Force has a number of guidance and counselling facilities: the chaplains, personal affairs officers, squadron welfare councils, the inspector, the judge advocate staffs, personnel advisors for civilian employees, the Red Cross, medical officers, the "complaint hours" of officers and supervisors in the chain of command. There is no denying the great importance of counselling as an adjunct of good management whether as safety value or positive instrument of adjustment. In the Air Force with its inherent risks and stresses good counselling is especially important. But how good are present AF counselling services? There is evidence that these facilities are uncoordinated, incompetently staffed, held in low esteem, and little used.

One squadron commander in SAC tells of the deterioration of one of his best staff sergeants. A high school graduate, a good administrator and leader, the sergeant begins to drink excessively and neglect his job. The commanding officer tries to help him, soon realises the symptomatic nature of the developing alcoholism, and tries to find psychiatric care for his sergeant. The base hospital has no certified psychiatrist and after one day returns the sergeant to his outfit with the report that he is ready for duty. Three days later the sergeant attempts suicide, is stopped, and hospitalised in San Antonio. The sergeant's services are lost, his colonel has had to take time from other duties to cope with a case he could not be expected to handle, and the squadron's organisation has been upset. Effective counselling on the base early enough might have

arrested the illness and kept a good sergeant on the job. Other instances could be given and symptoms and statistics cited: non-reenlistment, broken homes, mental illness, alcoholism, AWOL, low output, etc.

The quality of counselling is central to the whole problem of human relations, morale and management in the Air Force. Properly organized, staffed, and sold to officers and airmen as an "honorable" and highly useful agency of human adjustment and military effectiveness, counselling could well become an important arm of the human relations program. It could well serve both as a therapeutic device, and as a research instrument and continuing source of requirements for psychological and sociological research. A first step toward this goal should be an evaluation of the several counselling services as they now operate. An Air Force wide survey of the organization, personnel policies, and operations of the more distinct services previously listed might be made. With this as background, a half-dozen representative bases in the U.S. and abroad should then receive intensive investigation to see how counselling actually proceeds at base, wing, and squadron levels. Attitudes of airmen and officers would provide a crucial part of the picture. On the basis of these surveys an improved and possibly centralized counselling service might be conceived and even established experimentally at one base or in a few wings. Needless to say, such a program presents great problems of cooperation on various fronts. But, it would seem, the promise is great enough and central enough to justify considerable effort.

The experience and resources of the Public Health Service in the mental

hygiene field should be utilized for Air Force purposes. It is suggested that a demonstration center (such as Phoenix) be established at an appropriate air base, to be jointly conducted by the PHS, the School of Aviation Medicine and the Institute. The Institute would be responsible for the community research aspects of the experiment and the School of Aviation Medicine for the clinical research aspects. Problems of incidence, nature of case load and referral sources, attitudes and information levels of the wing base population, processes of acceptance and rejection operating over time, etc., would be some of the topics to be researched by the Institute. The research problem would be to establish a base-line of community knowledge prior to the establishment of the center and follow the progress of the center in the life of the community. The center's services should be expandable to the community's saturation point.

AN EVALUATION OF NAVAL NEUROPSYCHIATRIC SELECTION

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Prepared for
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'N EVALUATION OF NAVAL NEUROPSYCHIATRIC SELECTION

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(This report summarizes the research investigation on neuropsychiatric selection procedures in the Navy conducted during the last three years under the auspices of the Office of Naval Research and involving to date the careful study of over 20,000 cases. It has been demonstrated that neuropsychiatric selection at the training station level does result in the lowering of subsequent neuropsychiatric attrition during service. There is a curve of diminishing returns, however, which indicates that neuropsychiatric screening should be practiced cautiously and suggests the existence of an optimal point beyond which an increase in the screening rate down not correspondingly lower the subsequent attrition rate. It is concluded that neuropsychiatric selection as practiced in the Navy is demonstrably valid.

In an attempt to prevent the high neuropsychiatric attrition rates typical of World War I, the Navy, in 1941, instituted a program of neuropsychiatric selection or "screening" at all Naval Training Stations. The details of this program at a typical training station have been described elsewhere (5,6,8). This report will confine itself to an evaluation of the validity of neuropsychiatric selection.

Since Naval recruits are presumably screened either at an induction center or a recruiting station, one may wonder why the Navy needed to institute another screening program at the training station level. Naval Training Station neuropsychiatric selection is justified for four reasons:

1. Owing to the lack of facilities, shortage of trained personnel, the brief time available and the pressure for quotas, a good many mistakes are made at both the recruiting stations and the induction centers (4).
2. Screening at the training center makes it possible for those people suspected of neuropsychiatric unfitness to be placed on an observation ward where they may be studied more carefully over as long a period as is necessary with whatever ancillary examination

are indicated. This results in a careful, more intensive examination than the brief examination typical of the recruiting station and induction center. The importance of this careful opportunity for ward observation is evinced by the fact that approximately one-third of the men admitted to psychiatric wards for further observation and possible discharge from the Navy were found to be fit for duty and were returned to that status. Had final decision on these men been rendered as a result of a brief screening examination, they would have been lost for Naval service (5,6,8).

3. Screening at the training stations makes it possible to send some suspected recruits to trial duty so that a final decision may be held in abeyance until the man has had an actual opportunity during training to show what he is worth.

4. There are many men who will not make good during the training period, but who remain undetected at the original screening examination. Having a neuropsychiatric program at the training station level makes it possible to dispose of these men before they are passed on to the service. Thus, during the last war some 10 to 20 percent of all cases discharged at the training station level were cases who were not detected during the original screening examination, but who went bad during subsequent training (5,6,8).

The author of this report, under the auspices of the Office of Naval Research, has directed an experimental investigation of the validity of

Naval neuropsychiatric screening involving a sample of some 17,000 cases. The following hypothesis was set up for investigation. If Naval neuropsychiatric selection was successful in lowering neuropsychiatric attrition during service, there should be an inverse ratio between the number of men screened at the training station level and the number of subsequent neuropsychiatric discharges during service. In other words, the more men screened out for neuropsychiatric reasons during training, the fewer that should be discharged subsequently during service. The experimental design involved the selection of large random samples of recruits of roughly the same caliber who were screened by the same procedures utilized by staffs of roughly the same professional competence, but showing differences in the number of men screened out at the training station level. These conditions were met by samples from the training stations at Great Lakes, Newport and Sampson. The caliber of the men was roughly the same, the same screening procedures were used, and the staffs were of equal professional competence, but there were differences in the screening rates due to the fact that the commanding officers at these three training stations varied in the support they offered the screening program. The commanding officer at Great Lakes supported the program unqualifiably and allowed his unit to screen as many men as they wished to. The commanding officer at Newport held the screening rate to about four percent of incoming complement, while the commanding officer at Sampson refused to agree to the discharge of any but a few cases. The data have been reported extensively elsewhere (2,3), but are summarized in the accompanying table.

As will be seen from the table the expected inverse ratio between screening rate and subsequent attrition appears in the samples for April, June, and July of 1943 when conditions were judged as adequate for our

RELATION OF TRAINING STATION NEUROPSYCHIATRIC SELECTION DISCHARGE RATE TO SUBSEQUENT NEUROPSYCHIATRIC DISCHARGE RATE DURING SERVICE

	April 1943			June 1943		
		NP Discharges			NP Discharges	
		Screening	Subsequent		Screening	Subsequent
Station	N	%	%	N	%	%
Great Lakes	1525	4.5	1.5	1347	5.9	3.2
Newport	1173	2.6	1.8	1294	4.2	3.0
Sampson	2823	0.7	3.0	1284	0.7	3.7

	July 1943			January 1943		
		NP Discharges			NP Discharges	
		Screening	Subsequent		Screening	Subsequent
Station	N	%	%	N	%	%
Great Lakes	1350	5.2	3.3	1310	4.4	2.6
Newport	1310	3.0	3.6	1256	5.0	3.7
Sampson	1354	1.3	5.0	1350	0.7	4.1

experimental design. The results are statistically significant except for the June sample and even here the trend is in the right direction. The January sample was studied to check our prediction that at Newport the expected result would not appear that month as the screening was not adequate at that time. The table confirms our prediction concerning Newport, and it will be seen that the expected ratio appears between Great Lakes and Sampson where screening conditions were adequate at this time.

Since our hypothesis is supported by our results we consider the serviceability of neuropsychiatric screening in the Navy has been demonstrated. If, however, one examines the figures carefully, one notices that there is a curve of diminishing returns and that the saving in subsequent neuropsychiatric attrition rate is not in direct relationship to the screening rate at the training stations. In other words, as one discharges more and more men, one gets less and less saving in terms of subsequent attrition. This curve of diminishing returns indicates that neuropsychiatric screening can be practiced too enthusiastically and that there is probably an optimal point above which it cannot go with benefit. This optimal point must always be established in terms of the quality of the men being taken into the military service at any particular moment.

The curve of diminishing returns is further supported by other references (1,2,9) in which studies have been made of men who were considered to be borderline neuropsychiatric material, but were nevertheless sent to duty. While the subsequent attrition rate in these borderline groups is always greater than that for a group of "normal" recruits, it is not, however, high enough to indicate that this group is not on the whole rendering adequate service. It seems best then to propose that neuropsychiatric screening be handled with caution.

What is neuropsychiatric screening doing? On the basis of our data it seems safe to conclude that neuropsychiatric screening is a valid procedure when it concentrates upon the elimination of those men who are palpably unfit for military service. Unfortunately many cases of such palpable and overt unfitness do filter through to the training station level where they need to be eliminated. Neuropsychiatric selection, however, does not seem to be very successful in predicting among borderline cases those who will breakdown later in service. Such later breakdown is in great part dependant upon environmental circumstances such as morale, leadership, and the actual demands of combat which cannot be accurately predicted by the psychiatrist at the training station level. If we think of neuropsychiatric disability as spread over a continuum from the obviously unfit through the borderline cases, who will show some tendency to break down under unfavorable conditions, to the completely normal group, we can say that the function of neuropsychiatric screening seems to be the removal of the palpably unfit who will not render adequate service under any conditions. Better than this, neuropsychiatric screening cannot do. It can, however, help among the borderline conditions by locating those men whose future chances of adjustment can be improved by selective placement or by mild therapy of some kind at the training station level. Even under ideal conditions, however, a certain amount of neuropsychiatric attrition can be considered to be inevitable. Such subsequent breakdown, however, can be helped by the improvement of leadership, morale, etc., which matters are not the function of this report.

The duplicating of neuropsychiatric screening at later stages of service, such as staging areas, receiving ships, etc., can serve three

important functions:

1. It can serve to locate sources of poor morale and poor leadership and indicate the need for their correction.
2. It can locate cases who will benefit by mild therapy or selective placement and who can then continue on duty.
3. It can quickly dispose of those men who become unfit during service and are no longer able to perform efficiently. It is therefore suggested that in addition to retaining neuropsychiatric screening at the training station level, it be instituted at subsequent periods during combat service (7).

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A BRIEF SUMMARY STATEMENT OF SOME SOURCES OF EMOTIONAL MALADJUSTMENT IN AMERICAN CULTURE FROM THE POINT OF VIEW OF MILITARY MANAGEMENT

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by

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1. The Emotional Requirements of Military Life.

Emotional maladjustments in the American culture create a variety of problems for military management. In general, most emotional maladjustments unless properly dealt with are likely to become exacerbated under the conditions of military life. However, like civilian society, the military establishment has informal techniques for dealing with maladjustments and in fact certain types of maladjustments of civilian life are of no consequence or are actually reduced in military service.

The sources of emotional maladjustment in the American culture assume significance for those concerned with military management when certain of the basic emotional requirements for adjustment to the military establishment are kept in mind. This summary deals exclusively with the sources of emotional maladjustment in American culture and not with the sources of emotional stability on which the American military establishment is built and operates. The following characteristics of the military establishment as compared with civilian society are considered minimal for assessing the major sources of emotional maladjustment in American culture from the point of view of military management.

a. The military establishment is overwhelmingly a male society. All efforts to make the military establishment compatible with family

life and monogamous heterosexual relations which operate for a regular military establishment during peace time are of limited effectiveness in a period of military emergency or when large masses of troops must be stationed overseas. The result is that the general tensions of adult life plus the specific tensions of military service must be coped with by the individual without the support or gratifications of family life traditional to civil society.

b. The military establishment is a social organization which involves continual exercise of management and command in order to achieve a planned coordination of immense scope and detail. As opposed to civilian life where large areas of human behavior are self-directed or where coordination takes place on an automatic or traditional basis, military life gives the individual the impression of extremely close supervision of his behavior. Military life becomes sharply contrary to civilian life when it is recognized that the task of command and management must be extended over wide areas of human behavior which in a democratic society are considered as private, personal, and therefore subject to a considerable degree of individual self control.

c. The military organization in the course of achieving its objectives creates levels of tension and anxiety which lack counterparts generally in civilian society. Until the threat of aerial bombardment developed, American civilian society was unfamiliar with such levels of tension and anxiety except for particularized sub-groups such as workers in extremely hazardous industries.

d. Military life is characterized by wide areas of gratification, enthusiasm and freedom from certain types of responsibilities not found in civilian society. For a significant number military service represents an increase in their standard of living. These gratifications tend both to increase morale and control of tension and anxiety, but at the same time create other psychological problems, for example, guilt.

e. In World War II, ideology and values appeared to work only indirectly and to a limited extent in conditioning unit morale and in assisting the individual to maintain personal integration in the face of external threats. American civilian "morale" in World War II was in this respect similar to military morale. There is no reason to believe that the role of ideology might not sharply alter in future military situations.

f. Service in the military establishment represents to many individuals an interruption in their projected life or career plans. As such military life stands in opposition to the heavy emotional investment which American culture requires an individual to make in his life or career plans.

g. Military life has been characterized as being authoritarian, stratified, and traditional. These characteristics are also found in varying degrees in civilian life although on the whole to a considerably lesser degree.

2. Perspectives on Emotional Maladjustment.

Emotional maladjustment can be seen as the outgrowth of conflicts between the individual's biologically rooted impulses and the restraints and pressures placed on the individual by his family and society. The inability of the individual to cope with this conflict is defined as neurotic or emotionally disturbed behavior. This conflict is present in all individuals and accounts for the generally accepted continuity between the normal and the abnormal.

Scientific theories on the sources of emotional maladjustment can be grouped under two main headings.*

a. Deviations in child rearing or socialising the individual which can be traced to the particular treatment of the individual by his parents or parental substitutes. Clinical observations among the emotionally disturbed has been the major source of knowledge. Such data is usually referred to as the psychogenic (or psychodynamic) life history of the individual.

b. The other scientific view of the sources of emotional disturbance is the attempt to understand conflicts in the American culture or in sub-groups of the American culture which have the effect of developing strains of emotional conflict in individuals or in significant groups within the culture. This approach, involving sociological and cultural explanations of society, is no longer viewed as a conflicting approach to the psychogenic life history but rather a means of amplification and cross-validation.

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* Throughout this summary hereditary and organic factors are not discussed.

The two types of knowledge have different potential application to the problems of military management. The generalizations of individual psychodynamics supply the basis for much of the current selection procedures for personnel so that individuals will not be assigned to tasks which are likely to create tensions beyond their ability to master. These generalizations are at the basis of the techniques of psychotherapy employed on those individuals whose military experiences have produced severe emotional maladjustment. The second type of knowledge has relevance for both of these tasks; yet its main potential lies in the modification of training, organizational and management procedures which involve large numbers of individuals.

Clinical literature on psychogenic details of emotional maladjustment is vast while scientifically controlled observation is still limited and must remain so because of the complexities of human behavior. This type of knowledge is not central to this summary except in the important assumption generally accepted that the uniformities of American culture which effect emotional maladjustment manifest themselves in terms of psychological patterns established by the clinician. Generalizations hinge on the crucial importance of early childhood experiences in equipping or failing to equip the individual with personal controls over his impulses and the resulting ability or inability to accept social controls. The observations from the clinical approach relevant for understanding the cultural sources of emotional maladjustment fall into two groups:

a. Psychodynamic mechanisms of the individual by which emotional conflicts are resolved. Psychodynamic mechanisms isolated and generally accepted by students of psychopathology involve such terms as repression — the pushing of a disturbing memory out of consciousness; projection — a tendency to react to tendencies within one's own personality as though the tendency belonged to someone else instead of to oneself; displacement, introjection, fixation, regression, etc. Although uniform terminology has yet to be developed, these mechanisms provide the framework for the clinical understanding of psychopathology which involve the unconscious elements in human behavior.

b. The clinical approach makes possible the establishment of certain generalizations linking specific childhood experience to adult psychopathology. Conflicts over weaning, toilet training, rivalry with brothers and sisters, sexual investigations beginning early in childhood and leading to sexual interest in parents, are some of the earliest conflict situations which require clinical and psychoanalytic techniques in order to link the specifics of these conflicts to adult emotional disturbances.

3. Generalizations Concerning Social and Cultural Environment as Sources of Emotional Maladjustment.

Efforts to relate emotional maladjustments to the broad context of the American culture, have not as yet produced a body of systematically collected data linking psychodynamic mechanisms and adult psychopathology precisely to social factors. Yet a variety of social scientists are collecting a body of observations on the main characteristics and

stresses in American culture which contribute to emotional maladjustment. All of these researchers start from the assumption that American culture is a highly industrialized culture characterized by constant social change which results in emotional tension. Industrialization leads to urbanization involving the concentration of large segments of the population in relatively small areas without necessarily compensating psychic gratifications.

Most social scientists agree that age, sex, economic status, marital status, race, nationality, residence and natifity, or for that matter any single social index or group of indices is of limited importance in understanding or isolating the sources of emotional maladjustment in our society. Even the so-called ecological studies in which psychoses is rather highly correlated with residence in certain areas of the city are viewed as producing only indirect indicators of the underlying social context which is the source of emotional disturbance. Instead social scientists have sought to relate emotional maladjustment to broader phases of the environment which impinge on the individual; for example, family dynamics, occupational system, and our value system.

Family Dynamics. Examination of the psychogenic traits of individuals leads to close linkage between insecurity and anxiety and the treatment the child receives from his parents. In order to develop the psychological mechanisms for dealing with insecurity and anxiety which the individual must face in the armed forces, his family must have provided him with not only physical safety and welfare but also

love and affection. Love and affection is of fundamental significance but likewise is consistency of love and affection. Evidence has been gathered establishing that disruption of family solidarity and increasing impoverishment of family life in the American culture frequently has the attendant effect of limiting the ability of the American family to provide the necessary amounts and consistency of love and affection. The disruption and impoverishment of the American family is seen as a consequence of industrialization which alters the position of the women in society by placing them on the labor market and as the outgrowth of a wide range of values emerging in American society which imply depreciation on familistically oriented attitudes. The disruption of family solidarity is also seen as a by-product of inter-marriage between ethnic and class groups made possible through widening standards of democratic practice.

Equally significant in creating insecurity and anxiety is the observation which places crucial importance on inconsistency in parental values in approaching the child. The inability of parents to develop in the child from birth a consistent set of habits, attitudes and values, rewarding the child for inconsistent behavior, as well as the failure of the parents to present their lives as consistent and meaningful seem to be characteristics — of broken or unbroken homes — which prevent the development of emotional maturity.

The dynamics of the American family implies for military management increased problems connected with emotional maladjustment. Primary group solidarity is an important basis for military morale. Individuals who come from a family background not characterized by high social solidarity will find it difficult to integrate themselves and develop social solidarity with substitute groups such as the primary groups in military formation. In particular, such individuals lacking ego strength will be less able to adjust to military discipline and interference with their personal lives which military existence requires. Such individuals when they do develop attachments in military units frequently become overattached to specific individuals and over-react to specific individuals and over-react to separations from their associates.

The American family is primarily dependent for its status and income on the occupational status of one member namely, the husband and father. However, in the process of socialization the boy has first a tendency in segments of the population to form a direct feminine identification since his mother is the model most readily available and significant to him. In the process of maturation, the identifications he develops with his father are not those to a father who is all powerful, stern and a rigid disciplinarian. The American family is not characterised by paternal dominance as in the case of the German family. In fact much of the emotional tone of the American culture with its emphasis on freedom and lack of orderliness stands in opposition to the requirements of military discipline.

The mother as an emotional model coupled with the lack of firm paternal identification is not necessarily the most appropriate for the boy as he enters adulthood and in particular, it is inappropriate for military service. The frequency with which mother fixation is involved in various types of neurotic and psychotic disorders in civilian and military life is strong evidence of this point. The military establishment is a male society in which the psychological modes of adjustment learned in a mother-oriented family is in sharp contrast with the requirements for adjustment to military life. The young male fails to develop the requisite ego strength and ability to for alternative attachments to males in the army required for group solidari so significant in coping with tension and anxiety.

Whether it be military life or civilian life much of what is learned in the family has to be renounced by the young male with the result that he looks with great scepticism on his early training. The clash between the orientation inculcated in the family and the requirements of adult life it is held by some social scientists, leads the individual to be prone to the attitude that he has been deceived and is very likely to be deceived. American culture is characterized by such a hypersensitiveness which might be almost described as "paranoic". Hypersensitiveness of this type may mean that the individual is not prone to form attachments easily, especially if the individual has more authority — as in the case of his officers. It has frequently been pointed out that individuals who resent authority may themselves at times act in an authoritarian fashion.

Suspiciousness of authority — or anti-authoritarianism — which is extremely widespread in American culture need not only be traced to family dynamics but strengthened by many basic values in American culture. As a cultural trait it interferes with adjustment to over-rigid discipline but seems to protect the individual's sense of self esteem and thereby contributes to emotional stability.

Reaction to family identification although a source of emotional maladjustment for some male offspring in civilian life, has particular significance to military management. Military service for some supplies an orderly process by which emancipation from family and particularly feminine identifications can be overthrown without the creation of guilt because it is legitimated by cohorts and by the mission that the national military establishment has to perform. However, the desire to prove oneself a man may be so powerful that instead of contributing to the viability of the military institution it has the effect of leading the individual to refuse to accept the required discipline. The cult of manliness can be a reaction in which the individual must go to great lengths to prove to himself and to his cohorts that he is fully equipped with the psychological characteristics of masculinity. The result may be that Mama's boy in order to prove that he is a man becomes a super-tough who cannot integrate himself into a military formation or abide by any authority.

The American family assigns an important role in socialization the individual to his peer group. The decline of parental authority implies a growth of dependence on the attitudes of playmates and friends at

each age level. Peer groups as key determinants of social attitudes leaves the individual highly unsatisfied and without clear cut rules for guiding his behavior. Dependence on peer groups becomes a source of emotional stress particularly in adolescence at a period just before entrance into military service. The adolescent gives the impression of flexibility and readiness to adjust to new situations but closer examination tends to indicate that this flexibility is a guise for the lack of social maturity. For military management this has two consequences: very young selectees are very sensitive to command by older and more experienced men, and in turn they will seek their age mates as a source of emotional stability. But age mates find themselves in the same dilemma of adjustment to new life situations and are unable to supply requisite leadership. Thus the apparent flexibility of the adolescent who is dependent on his peer group may make easy initial adjustment but not necessarily display long term adjustment which requires a willingness and emotional maturity to accept authority.

Occupational system. The occupational system of the American culture is inherently deeply competitive, although competitiveness has lost most of its attractiveness to the individual. Success through competition in civilian life is a value taught by family and school although competition is less appropriate for success than it was a generation ago.

The individual who succeeds must accommodate himself to a very complex and rapidly changing occupational system. Adjustment to the occupational structure creates tensions that test the individual's

personal and social controls. Pressure for success through competition is most heavily concentrated in the middle class with the lower and upper classes less preoccupied with this norm and therefore less subject to the attendant tensions. In the competitive struggle the psychological burden is made heavier because the individual is required to behave like a good loser in the event that he is unable to achieve the appropriate success.

Management of competitive orientations which find their source in the financial incentives of civilian society and which produce attendant psychological tensions is indeed a complex phenomenon for the military establishment. There is reason to believe that for some army life supplies a release from such tension and thereby is likely to afford a reduction in emotional maladjustment. This is particularly the case since military life particularly in the non-combat aspects supplies such individuals with alternative gratifications. The material gratifications are assured the individual regardless of his performance and are augmented by various forms of non-material gratifications.

However, the reduction of tension connected with economically motivated competition must be supplanted by positive feelings of group loyalty if high levels of motivation and initiative are to be maintained within the limits of military discipline. On the other hand, individuals who seek to apply competitiveness to army life frequently find themselves unrewarded both by their superiors and equals for their efforts. Unable to understand the source of their failure, such individuals frequently "go sour" and become behavior problems.

The occupation system of American culture is not only subject o to intense competition, but also subject to extremes of instability. Until the last decade America was subjected to extremes in level of employment which had important implications for emotional stability. The loss of one's job through no apparent reason which could be connected with one's capacities is a severe blow to the self esteem and psychological integrity of the individual. Since they will be under thirty, the bulk of the armed forces will themselves not have experienced the trauma of unemployment and its psychological consequences. Unemployment and economic instability will have affected them through their families since a major portion of young recruits to the armed forces were born during the depths of the last depression. A depression implies a lack of the material requirements for effective family organization which in turn implies basic insecurities. Whether unemployed, or apprehensive about unemployment, the circumstance to which the family is subjected creates in both parents heightened anxieties and interferes with effective socialization of the children. These anxieties are coupled with a loss of authority of the father which further disrupts the family.

The psychological consequences of economic and occupation instability are not eliminated by sudden increases in employment. To the contrary, sudden expansion has in the past brought with it certain types of emotional maladjustments as severe as those connected with depression and unemployment. As in many other aspects of emotional maladjustment, sudden and sharp shifts in the organization of society

produce emotional tension by presenting the individual with new situations for which he has not been previously equipped. (As an extreme case, suicide has been traditionally connected with economic depression, but can also be found among groups who have experienced sharp increases in their standard of living.) Aside from fluctuations in the business cycle the occupational structure of American culture is constantly undergoing change as a result of long technological changes. These changes social scientists claim are in particular affecting the lower middle class adversely and heightening its emotional insecurities. Evidence on this very strategic topic is difficult to gather and as yet there is no general agreement.

The occupational system as a source of emotional insecurity is related to the particular patterns of migration in the United States. Migration is not a specific social fact to which emotional maladjustment can be traced, rather it is part of the general industrial organisation of American culture which subjects the individual to change which he is not equipped to meet. In the past, the main patterns of migration in American culture arose from the immigration of large numbers of Europeans to these shores for whom the expanding economy has created employment. Research has indicated the tremendous emotional adjustments associated with these migrations, especially as they created conflicts between the first generations of immigrants and the next generation of their sons and daughters. A significant proportion of the armed forces will be second generation immigrants whose families had to undergo extreme hardships in adjusting to American culture. Conflict between immigrant parents offspring is seen as significant cultural source of emotional maladjustment in the United States.

More recently with the closing off of immigration the major pattern of migration in the United States has been the movement from rural areas to urban centers, and many young recruits will come from families whose parents had moved from farm areas to urban centers. Here again migration is in part due to the occupational opportunities created by ever-increasing industrialization. Much less is known about the impact of emotional adjustment of such migration. However it seems clear that the strains attendant on such shifts are probably less than those connected with immigration from abroad because of the obviously closer cultural similarity between rural and urban areas in the United States as compared with the gap that has to be bridged between American and European culture.

Our Value System. Emotional maladjustment in the American culture can be linked to the clash between competing values and ideals to which the individual is subjected as well as the clash between ideals and actual behavior. In a society with as rapid a history of expansion and with as short a history of tradition, clashes in values and ideals can be expected to become dominant cultural themes. The ability to integrate and make use of these contradictory themes has been one of the unique achievements of American culture. But its implications for emotional stability have been complex and have at times contributed to emotional maladjustment.

Contradictions in fundamental norms pervade the economic, the political, social and legal spheres of life. In no country in the world is the ethos of individualism and the right to rise to the top economically as strong as it is in the United States; yet at the same time the belief in a fundamental equalitarianism is a strongly motivating factor to which each individual must adjust himself. Respect for the law is highly developed in the United States and the legal system represents a historical achievement in justice; yet at the same time disrespect for aspects of the law is viewed and practiced as one of the requisites to maintain the self esteem and to strengthen the equalitarianism. In ethnic relations America's dilemma presents a high point in the clash between values and behavior. For the fundamental preoccupation with the common dignity of man stands in opposition to the facts of discrimination and segregation.

All societies require the individual to adjust to competing values and ideals, but it is clear that in the American society the problem of accommodation is extremely difficult and the society must pay a price emotionally. Adjusting to competing values may mean the development of guilt and the interference with personal gratification. The impact of competing values and the difference between ideals and behavior seems to be of different importance to different class groups. Social scientists in particular point to the middle class as that portion of the social structure which is most beset by the contradictions of social values and actual practices.

In civilian life part of the accommodation to competing values and to the clash between values and practices is accomplished through the looseness of social organization which permits the individual "To look the other way". But the American civilian is highly sensitized to these contradictions and past experience indicates that he is much less tolerant of contradictions in values found in the army than those encountered in civil society. In part this is due to the belief that military life which involves the threat of death should be more democratic in certain respects -- than civilian life, and that military establishment organized by the federal government, an instrument of the population at large, should brook no or little hypocrisy. From the point of view of military management all this implies in particular extreme sensitivity to surface manifestations of inequalities of sacrifice and reward. For many such manifestations become a source of discontent which is exacerbated by the fact that the military establishment must extent its supervision even outside of combat over most of the individual's behavior.

The value system of the American culture not only has deep contradictions to which the individual must adjust but the values themselves are constantly undergoing change. (For example, in perhaps no area as much as in sexual mores is the American value system undergoing change.) Each shift brings with it insecurity, anxiety, and guilt connected with knowing the appropriate response. It cannot be inferred that since the American value system is constantly undergoing shifts that the individual is thereby conditioned to accept shifts in values and by implication is likely to make the transition to the value system of

the army — which emphasizes authoritarianism, stratification and tradition — with greater ease. To the contrary, all evidence points to the contention that individuals who have a consistent set of values and are strongly involved in these values are the ones who are most likely to be able to adjust to situations involving temporary modification in their values. Over-rigid value identifications which are frequently a guise may, of course, be as detrimental to emotional adjustment as the lack of a set of stable and consistent values.

The clashes in American ideals have the implication that both in civil society and in the military establishment the character of men is more important than the formal authority which they wield. This is widely recognized in the personnel practices of industry and government in the United States and a developing perspective in the armed forces. Leadership which does not require frequent invocation of formal authority but proceeds on the basis of technical competence and interpersonal skill, can make significant contributions to raising morale and containing emotional tensions in the armed forces.

THE DEVELOPMENT OF MORE EFFECTIVE METHODS OF TRAINING ELECTRONIC TECHNICIANS

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INTRODUCTION

This report

This report is concerned with the experimental development of more effective methods of training electronic technicians in the Navy.

Definition of terms

Electronic technicians Electronic technicians are enlisted personnel of the Navy, charged with the responsibility of maintaining radio, sonar, and radar equipment. Most of the technicians on entering training are high school graduates, 18 to 20 years of age.

Maintaining equipment The expression, maintaining equipment, involves duties from simple adjustment to complex alteration and repair of electronic equipment.

Electronics The term, electronics, as used herein, is a phase of electrical application that involves vacuum tubes. This definition applies to civilian as well as the military aspects of the science.

Methods The word, methods, is used in its broadest sense, including classroom techniques, subject matter content, class size, instructor assignment, scheduling and other aspects that may influence the teaching learning situation.

More effective methods More effective methods are those that will permit the training of students in a shorter period of time without sacrificing present standards, or with result in a reduction of elimination due to scholastic causes, or will allow better training of students in an equal or lesser period of time

than now required. As far as the Navy Department is concerned, the achieving of any one of the preceding three would be interpreted as demonstrating improved methods. Since an accurate measure of whether one man is better trained than another is difficult to determine, the first two are more indicative of improved methods of training electronic technicians.

Procedures

This experiment was conducted at the U. S. Navy School, Electronics, Treasure Island, San Francisco, California. The title of "craftsmen" was given to it by the enlisted personnel who participated in the experiment as instructors. The techniques of instruction developed in the experiment frequently will be referred to as "craftsman" techniques or procedures.

Writer's travels In developing this experiment, the writer made one trip to the U. S. Navy School, Electronics, Great Lakes, Illinois, in November 1948 to study the instruction being conducted. Three trips, each four weeks long, to the U. S. Navy School, Electronics, Treasure Island, San Francisco, California. The first trip was in February and March, the second in April and May, the third in August and September, all in 1949. The first of the three trips concerned itself primarily with:

1. Revealing to the staff of the school the reasons why the Navy Department wished to conduct the experiment, together with the nature of the experiment, and what the possible outcomes were.
2. Selecting the instructors to do the experimental instruction.
3. Conducting the inital training of the experimental staff, largely concerned with concepts, probable procedures, and development of instructional material.

The second trip involved principally:

1. Further training of the experimental staff in the instructional techniques to be employed.

2. The review, correction, and further development of instructional materials.

3. Establishing a system of selecting trainees for the experiment.

4. Establishing procedures for recording and reporting data.

5. Initiating the instruction.

6. Outlining procedures for further development of instructional materials, in service training of instructors, and training of additional instructors.

The final trip to Treasure Island was concerned principally with:

1. Gathering data in connection with the experiment and regular course.

2. Making preliminary evaluations of the experiment.

3. Outlining procedures for gathering of additional data and reporting same.

4. Developing procedures for training of additional instructors.

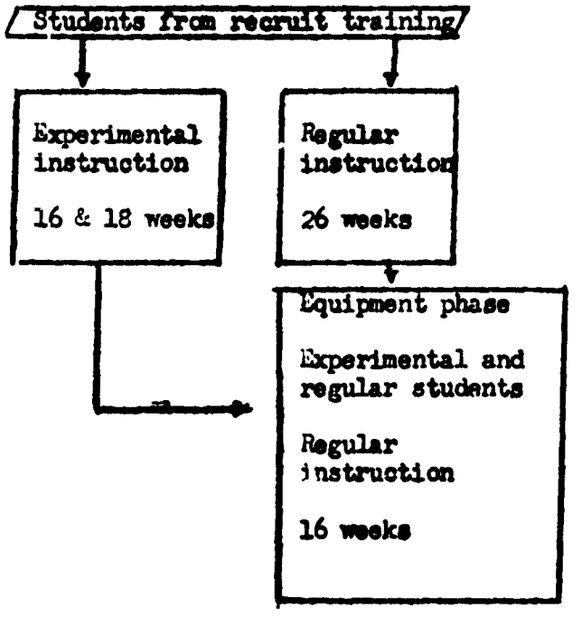
5. Taking initial steps in the planning for a possible conversion of the regular course to the craftsman techniques.

Experimental instruction

Five classes of 14 students each were selected for experimental instruction. The first class convened on 25 April 1949, and the others at two-week intervals thereafter. The students selected for the experiment were as near representative as existing measuring devices, information available, and judgment would permit. The first experimental class was under experimental instruction for 16 weeks, and the other four, for 18 weeks each. At the end of this period, the students joined a regular class that was entering the equipment phase of training, the last 16 weeks of the regular 42 week course, and the instruction for the remainder of the course was the regular instruction for both groups. Figure 1 is a flow-chart showing the paths of the students through the experimental and regular portions of the course.

Figure 1

Flow of students through the regular and experimental courses.



Each experimental student was assigned a contemporary in the regular course to be used as a basis of comparing progress. The contemporaries in the regular course and the experimental course were matched in ability, education and age. It was hoped at the outset that this matching technique would permit a valid comparison of learning growth under different forms of instruction.

Evaluation of instruction

The evaluation of instruction to determine whether the experimental methods were more effective or not was done at two points. One while the students were still under experimental instruction, and the other after these students had entered the equipment phase of the regular course. In the first evaluation, cross-check examinations were given to the experimental and regular classes having completed comparable subject matter study. In the second, the examinations written by the regular and experimental students were compared, together with an instructor's evaluation of the experimental students' capabilities in comparison to those of the regular students.

Methods prior to experiment

The methods of teaching prior to the experiment could be described as traditional, resembling closely those used in colleges of engineering. The time is divided equally between lecture and laboratory, with the lecture sub-divided into mathematics and theory. The laboratory is intended to provide practical exercises in applying the theory and mathematics

Lecture classes range in size from 40 to 65 students for a single instructor. One instructor usually teaches two periods of mathematics daily, another instructor, two periods of theory, and a third, four periods of laboratory. According to plan, both of the lecture instructors are to assist with the laboratory work, but in practice, seldom more than one is present.

The course may be described as academic with little credit being given for practical work. For the most part, success or failure in the course is contingent

upon the ability of a student to pass a written examination, the information for which could be gained without attending the lectures or the laboratory. A lecturer or laboratory instructor seldom is in charge of a group for more than two weeks, and in some cases it is for as little as one.

Chief characteristics of the experimental method

Only the salient features of the experimental method will be mentioned here as the details are described fully later in this report. The main aspects of the experimental method were manifest in attempts to use procedures indicated by the nature of the process of learning. The resulting salient features were:

1. The combining of the laboratory and theory in a manner permitting the instructor to integrate lecture discussion and practical application.
2. The integrating of mathematics with theory and laboratory. The mathematics taught is limited to that which is made necessary by the theory and/or practical work, and is taught when needed, and in the amounts needed.
3. Class size is limited to 14 or 16, and the class is taught by a single instructor for the entire period of the course, when possible.
4. There is a greatly increased emphasis on practical work and a lessening of emphasis on abstract theory.

To a large measure, this experiment is an application of the functional concept of education.

PART II

THE EXPERIMENTAL INSTRUCTION

Mechanics of the experiment — Instruction employing the experimental method began 25 April 1949. Five classes, on which accurate data was taken, were convened as indicated in Table I. In addition, other classes were enrolled in the experiment in order to preserve continuity of instruction until the experimental method could be evaluated.

TABLE I

CONVENING DATES AND DATES FOR ENTERING THE EQUIPMENT PHASE OF THE COURSE

Class	Convening Date *	Date entering Equipment Phase	Weeks Instruction
XP4-50	25 April	22 August	16
XP5-50	9 May	12 September	18
XP7-50	6 June	10 October	18
XP8-50	20 June	24 October	18
XP9-50	5 July	7 November	18

* All dates 1949

It may be noted in Table I that class XP4-50 received 16 weeks of experimental instruction while the others received 18 weeks. The additional two weeks were believed necessary to correct a deficiency detected in the coverage of direct and alternating current. Interestingly, this deficiency seemed to disappear without additional planned instruction in the subjects as the course progressed.

When entering the equipment phase of the course, the experimental classes were combined with regular classes as indicated in Table 2, and received 16 weeks of instruction. The instruction of the 16 week period was that of the regular course, and no attempt was made to change the instruction in any way.

TABLE 8

REGULAR CLASSES WITH WHICH EXPERIMENTAL CLASSES WERE COMBINED FOR THE EQUIPMENT PHASE OF THE COURSE

Experimental Class	Regular Class
XP4-50	24-49*
XP5-50	1-50**
XP7-50	3-50
XP8-50	4-50
XP9-50	5-50

* Twenty-fourth graduating class of 1949
** First graduating class of 1950

Collection of data ceased on 16 December 1949. This was due to the Christmas holiday until 4 January 1950, and the contemplated conversion of the whole Class A course to employ the experimental method soon after that date.

A typical lesson

Some of the instructors anticipated difficulty in integrating theory mathematics, and practical work, but after attempting to teach that way, they found it to be the natural way. The following is an example of a typical lesson outlined dealing with the voltmeter, in which the integration of the elements of theory, mathematics, and practical work is revealed.

1. Prior to this lesson, Ohm's Law, the effect of a magnetic field on a conductor carrying a current, and the physical structure of the D'Arsonval meter movement had been taught. This was the "old" material on which the new was built.
2. Each student was provided with a 1 milliampere, 27 Ohm meter movement mounted in an aluminum bracket. Mounted on the bracket also was a 10,000 ohm potentiometer capable of being used as a rheostat; two, four-point solder lug strips; and two pin jacks for test leads. The additional equipment supplied each student is a pair of test leads; two forty-five volt "B" batteries; and resistors of assorted values. Each student

previously had been issued a kit of tools containing another meter.

3. The presentation began in this manner:

   a. The instructor called the students' attention to the miltitester in their tool kit; and pointed out that it is possible to read several ranges of voltages by merely turning a switch.

   b. Some students had found that their meters could be damaged if too high a voltage were applied to the meter for the range selected.

   c. All had opened their meters and found them full of resistors. The lesson at hand now was to find out how these resistors were connected to the meter movement to permit the use of the meter with wide range of voltages.

4. Up to now the instructor had been doing the talking and demonstrating the points by calling the students' attention to the multitesters.

5. Next was a review of Ohm's law. The following were important points the instructor worked out on the blackboard:

   a. The drawing of simple series circuit containing a single resistor and a battery. Indicating the battery to be 10 volts and resistance 10,000 ohms. Solving for the current:

   $$I = \frac{10}{10,000} \qquad I = .001 \text{ amperes or 1 milliampere of current}$$

   The instructor would emphasize the fact that with 10 volts and 10,000 ohms the current would be 1 milliampere.

   b. A value of 27 ohms now was substituted for the 10,000 ohms and the current was calculated to be about 370 milliamperes. Attention was switched back to the meter movement. The instructor explained the movement has 27 ohms resistance and has a maximum current carrying capacity of 1 milliampere. The question was then asked, "What would

happen if a 10 volt battery were placed across the movement?". The answer was obvious, 370 milliamperes of current would flow. The meter would be ruined.

6. The problem was then stated, "How can a 27 ohm, 1 milliampere movement be made to read potentials of 10, 100, and 1,000 volts?".

7. The lesson now shifted back to the diagram on the blackboard containing the 10,000 ohms resistance. The question was asked, "How much current was flowing?". Answer: One milliampere. The next question, "With 100 volts in the circuit how many ohms resistance are required to limit the current to 1 milliampere?". The student was led to see that if the voltage rises and the current must be restricted to 1 milliampere, the resistance must be increased proportionately to limit current to 1 milliampere.

8. Attention was again switched to the 27 ohmmeter movement. Since this movement cannot stand 10 volts, enough resistance must be added in series with the movement to limit the current to 1 milliampere. A drawing of a circuit containing a 10 volt battery, a 27 ohmmeter movement and a resistor of unknown value was placed in a series circuit.

9. The question: If the meter movement were 27 ohms, ignoring the resistance of the battery, how much must the value of the unknown resistor be to make a total of 10,000 ohms: Answer: Simple process of subtraction, 9,973 ohms.

10. The students were then directed to select a resistor of that value and connect it in series with the meter movement. One end of the resistor was connected to a pin jack and the other side of the meter movement also to the pin jack. These were all soldered connections, the purpose being to provide practice.

11. The student's work was inspected by the instructor and then he was directed

to test his work by measuring 10 volts with the meter just contructed. The amazement of some students that it worked was one of the more satisfying moments of the day.

12. The students were then directed to compute the resistance required for a 20 volt, 50 volt, and 100 volt range. Then, in turn, select proper resistors, make the circuit modifications, and test their results.

13. During the work period, the instructor moved from student to student, inspecting and discussing the work. If an individual student had difficulty with the computations, the instructor provided the assistance. If a large number of the class was having difficulty with mathematics, the individual work was stopped and the mathematics needed was taught on the spot.

14. As the work progressed, the student recorded his findings in a personal notebook. This notebook was not one to be graded, but was the student's account of his work.

15. When the instructor felt mastery had been achieved, the lesson was ended, and the work moved on to the next topic without regard to whether it was the end of the period or not.

The procedure for teaching other topics would appear much the same, differing y in the routine as dictated by the subject matter content. An example of how voltmeter was taught in a regular class is included here so that a comparison be made:

1. In lecture: An instructor lectured for one or more hours on the construction of the meter. Usually no training aids were used. The lecture was illustrated by a blackboard drawing of meter circuits, and with each, students were required to compute values of resistance. With classes of 40 to 60 students, problems of the individual could not be recognized.

2. In the mathematics class: The organization of the mathematics class was

conventional, starting with arithmetic and ending with elements of trigonometry. While many of the problems to be solved contain elements of electricity, the fact that the mathematics taught matches the meter problems was a pure coincidence. The classes also were large, and individual instruction was impossible.

3. In the laboratory: The student in reporting to the laboratory was issued a prepared routine to be followed, step by step. Blanks were to be filled in, questions answered, and at the end of the day, the papers were turned in. Sometimes the laboratory instructor gave a brief overview of the assigned task. The equipment used was experimental panels. The values of resistors to be selected was limited to those mounted on the board, and the skill to be developed was the shoving of pins in pin jacks. If the students finished the work one hour early, the remaining time was wasted. If the student was unable to complete the assignment in the time allotted, that resulted in a failure.

Principles of teaching and learning

The experimental method was based on the principles of teaching and learning contained in School Administration[1]. An accounting is now made to reveal the degree to which the principles were honored in the experimental method. The principles of learning are stated first as: Principle I. The principles of teaching follow under each principle of learning, and are indicated by arabic numerals such as 1, 2, &3. The actions taken in the experimental method are listed under each principle of teaching and are indicated by a small letter of the alphabet.

1. J. H. Fox, E. E. Bish, R. W. Puffner, School Administration, page 83

inciple I: Learning is growth-like and continuous.

1. Begin where the learner is.

   a. The course shifted emphasis from subject matter to be covered to development of learning processes in students.

   b. Forms were used to gather information about the students so the instructor gains much information about the students' backgrounds before instruction begins.

   c. The classes were small, 14 students, making it possible for the instructors to determine readily the state of learning of each student.

2. The new must be related to the old.

   a. The first day of classroom activity was devoted to the exploring of common examples of electricity such as comb and hair, cat's fur and a piece of bakelite, copper and zinc pennies when used with a piece of paper moistened with saliva, form a source of electricity. Those concepts are within the experience of everyone.

   b. Each subsequent day's work was built on and related to the proceding work. Attempts were made to prevent gaps in sequence by planning each unit to use the skills or information gained in the preceding.

3. Pace must be adjusted to learners' capacity.

   a. No lock-step methods or routines were employed.

   b. The individualized work routines allowed the student to move at his own pace. The building of actual circuits lent itself to the varied learning rates. As an example, the building of a small radio transmitter was finished quickly by some students and slowly by others. However, once the circuit was completed, the students could study and observe its functioning for many hours, all the time gaining a better understanding. Because of the greater time needed by the slower

students, their degree of coverage was less proportionately.

Principle II. Learning is purposeful.

1. The learning must make sense to the learner.
   a. Every topic in the course of study was justified as needed and every unit possessed a worthy objective.
   b. The building of actual pieces of electronic equipment allowed the students to apply all the theory being taught.
2. Progress must be constantly appraised and redirected.
   a. Each instructor was briefed carefully on the goals his class should achieve. As the instruction moved forward, he judged each student's progress toward achieving that goal. Tests were used. Most of them were short, 5 or 10 minutes in length. The work of each student was observed daily.
3. Purpose must be kept in focus.
   a. The course of study was organized in such a manner that both the immediate and ultimate were readily discernible. In the training of the staff, the objectives to be achieved, and not the content to be covered were stressed.
   b. The concept of curriculum used with this experiment was that the curriculum was a vehicle designed to transport the learner from where he was to the objective.

Principle III. Learning involves appropriate activities that engage a maximum number of senses.

1. Learning results through self-activity.
   a. Classrooms and laboratories have been combined to facilitate the most appropriate learning activity whether discussion or practical work.

b. All theory presentations wherever possible were accompanied by demonstrations, and each student repeated the demonstration.

c. The instructor's duty during the practical work periods was that of moving from student to student, directing the learning activities.

d. Sufficient equipment was provided so each student had the materials needed to engage in appropriate activity.

2. Activities appropriate to the specific learning situation must be used.

a. All support subjects such as mathematics and hand tools, were taught based upon the principle of needs. When the need for teaching mathematics arose, it was taught. When the need for teaching the use of hand tools arose, appropriate, meaningful activities were used to teach it.

b. When it was desired to teach receiver alignment, actual receivers were aligned. When it was desired to teach transmitter neutralization, a transmitter was neutralized.

c. When the assembly of circuits was desired, circuits were assembled from actual parts, complete with wiring, soldering, and application of power.

3. Learning activities should engage a maximum number of senses.

a. All available visual aids were employed. This included mock-ups and circuit components, dynamic demonstrators, charts, cut-aways, and the like.

b. The cathode ray oscilloscope was used throughout the course to give the student a visual presentation of what was going on in the circuit. As an example, in studying filter action of the power supply, the oscilloscope was used to show the students the action of each component

in the circuit.

c. Sound was often coupled with test equipment such as the meter and oscilloscope. As an example in the aligning of a superheterodyne reciever, the sound of the signal was listened to as well as viewed on on the meter and the oscilloscope.

d. The sense of smell also was employed. The characteristic odor of a burned out transformer was experienced by each student. In future trouble-shooting work, the detection of this odor would be a positive indicator of the trouble.

Principle IV. Learning must be challenging and satisfying.

1. Teacher motivation of students is essential in making learning more challenging.

   a. Motivation stems best from a sense of accomplishment. A signls instructor was assigned the responsibility of teaching a group of 14 students. The instructor's motivation came from seeing his class develop. When an instructor senses accomplishment, he demonstrated further interest in his students who in turn responded with added interest in the work.

   b. The students in building functioning transmitters and receivers received a stimulus to work far stronger than any verbal suggestions to do so. The pride of accomplishment had no peers in motivation.

2. Appropriate and timely recognition should be given student achievement.

   a. No provisions had been made in the course for the granting of honors, other than the honor that comes from producing the best functioning receiver, or the transmitter that radiates the most power. The outstanding work of one student was recognized by the whole group and the recognition was both timely and appropriate.

3. Standards demanded of learners should be suitable to their ability.

   a. It was believed from the beginning that the only student that should be dropped from the course was a student who was a severe discipline case or who was emotionally unfit for the work. This was the case. The two students dropped from the five classes were due to illness.

   b. It was believed that any achievement was better than none and that if each student learned as much as he was capable of learning, he should pass the course. No student has been dropped from the course in spite of a wide range in accomplishment.

inciple V. Learning must result in functional understanding.

1. Memorization alone was temporary unless reviewed or put to use in a practical situation.

   a. No mass of information was presented in a form that was to be memorized. All information or facts were associated with practical applications as soon and as frequently as possible.

2. Course content should be organized into meaningful units.

   a. As was pointed out in Chapter IV, the whole course was divided into major units complete in themselves. The major units were divided into sub units, each representing a meaningful body of knowledge and each related to the whole.

   b. The units of work, such as electric motors, power supplies, or audio amplifiers were small enough in size to allow the student to see the "whole" of the unit, and yet large enough to provide a challenge incapable of being solved in a few minutes. Each unit when taken with other units formed the whole of the course.

3. Activities that simulate use situations are most effective.

a. The decision to eliminate "bread boards", and "panel demonstrators" for laboratory work was in recognition of this principle. No place outside of the school laboratory will "bread boards" be found.

b. The type of practical activities provided, such as soldering, use of test equipment, and trouble-shooting, are activities that will form the daily life of every electronic technician.

Principle VI. Learning is affected by emotions.

1. The instructor should strive to increase pleasant emotions and decrease unpleasant emotions of students in connection with the learning process.

   a. The classroom atmosphere was informal. Each student was allowed freedom of action as far as possible. The discipline control was purposeful activity and not conformity to rule and regulation.

   b. The instructor maintained a friendly attitude at all times, was approachable at all times, but also maintained the respect to which his position entitled him.

2. The intensity of emotional feeling affects learning differently in different individuals.

   a. The emotional set of each student was recognised. The homesick boy was encouraged, the cocky student often was given a task beyond his ability and humility returned. Some students required frequent prodding, others needed sympathy. Both received their proper treatment.

3. The expression of emotion is highly trainable.

   a. The few students that exhibited emotional outbreaks received the attention of the instructor and frequently the officer-in-charge attempted to get at the cause and assist the individual in remedying the situation.

b. Teaching the men to become good petty officers was a part of every day's work. This was done by making each man responsible for the condition of this equipment, cleanliness of work spaces, and in rotation, the supervision of the work of others.

Principle VII. Learning is affected by physical and social environment

1. The general physical environment should be suitable to the kind of learning taking place and to the activities for use in the learning situation.

2. Specific physical factors of the classroom should be suitable to the kind of learning taking place and to the activities for use in the learning situation.

   a. The instructional space and equipment were designed specifically for the experiment. The student benches were arranged to facilitate optimum effectiveness of teacher-pupil relationship. The best available equipment was provided. Lighting was the best of modern fluorescents.

3. The teacher should recognise and utilise the effects of social environment on learning.

   a. Whenever a student exhibited signs of difficulty, the instructor and officer in charge attempted to find the cause. In a few cases it was homesickness, other times it was personal problems.

Other aspects of the instruction

Improved scheduling In addition to providing a system of instruction that honored the principles of learning and teaching to a large degree, the experimental method achieved several other goals that contributed to increasing the effectiveness and efficiency of the school. With the regular method it has been difficult to keep the separate laboratory and lecture assignments together. Combining

lecture and laboratory solved this problem.

Laboratory reports — The need for the preparation of laboratory reports by the students has been eliminated by the experimental method. Evaluation of the student's laboratory work was done through daily observations of the student's work. The only notes taken were those used by the student for his review purposes.

Review and examinations — The time consumed by reviews and examinations referred to in Chapter II was largely eliminated by the experimental method. No longer is it necessary to allocate two days out of every 10 for review and examinations. Reviews were a daily, on-going process, not reserved for certain days of the week. Examination procedures were simplified also. Short, frequent quizzes were used as teaching devices. Only at the end of large units such as direct current, alternating current, and electronic fundamentals were major examinations given.

Reports requested

Since it was impossible for the writer personally to collect all the data needed, a schedule of reports was worked out with the officer in charge as follows:

1. The files of each experimental class upon the completion of the experimental instruction were requested. This included the students class record card, the original of all examinations except for the daily quizzes, the information questionnaires filled out by each student, and any other available information. The grades on all examinations were to be given in the raw form.
2. The raw scores made on the 18th Week Comprehensive Examination of experimental and regular students, indicating the form used. This examination, and an explanation of how it was used in comparing experimental and regular students is indicated in Part I.
3. The raw scores made on the 26th Week Comprehensive Examination in basic

electronics of the experimental classes and regular classes writing this examination between the dates of 1 September 1949, and 16 December 1949. This examination and an explanation of how it was used in comparing experimental and regular students is included in Part III.

4. The raw scores made on the Bureau of Naval Personnel, Special Electronics Examination of the experimental classes and regular classes writing this examination between the dates of 1 September 1949 and 16 December 1949. This examination was explained earlier in this chapter, and an explanation of how it was used in comparing the experimental and regular students is explained in detail in Part III.

5. The raw scores made by all the students regular and experimental in the biweekly examinations during the equipment phase of the course. An explanation of these examinations, and how the scores were used in comparing the students is included in detail in Part III.

6. All the Student Evaluation Forms used to obtain biweekly ratings of experimental and regular students during the equipment phase of the course. An explanation of this form follows:

Student evaluation form

It was desired to obtain an estimate of the students ability in the equipment phase of the course to supplement the information available in the biweekly examinations. In order to do this, it was necessary for the writer to develop a special form that would yield the desired information.

The form developed requested information on seven specific items, (1) significant weak points of students, (2) significant strong points of students, (3) ability in practical work, (4) adverse criticism of previous training, (5) favorable criticisms of previous training, (6) knowledge of electronic theory, and (7) ability in mathematics. The form is based on an assumption that unless a

student is outstanding either in a weakness or a strength, little information about the student is in possession of the instructor. Therefore, except for the few either weak or strong students, the majority of students were rated as average or normal. In this way, if the experimental students were rated as not significantly different than the regular students, the experimental students could be judged as being comparable to the regular students.

The instruction for the administration of the Evaluation Form were that it should be done by a committee of instructors that knew the students the best. should be done on the Friday afternoon of the week in which the students complete the course, and when factual information was missing, the best judgment of the committee should prevail. The Student Evaluation Form and a schedule, table 3, for reporting the evaluations of the students follows. A detailed explanation of the comparisons made employing the information gained from the form is given in Part III.

STUDENT EVALUATION FORM

STUDENT_____ CLASS_____ SUBJECT_____

INSTRUCTOR_____

Evaluation of Electronics Student.

1. Did this student give evidence of any outstandingly weak points?
   Yes ( )
   No ( )

   a. If yes, how was this weakness detected?
      1. By written examination. ( )
      2. By oral examination. ( )
      3. By inability to answer questions. ( )
      4. Through low-quality homework. ( )
      5. By inability to do practical work. ( )
      6. Other reasons—write out:_____ ( )

      7. Briefly describe this weakness_____

2. Did this student give evidence of any outstandingly strong points?
   Yes ( )
   No ( )

   a. If yes, how was this strength detected?
      1. By written examination. ( )
      2. By oral examination. ( )
      3. By ability to answer questions. ( )
      4. Through quality of homework. ( )
      5. By ability to do practical work. ( )
      6. Other reasons—write out:_____ ( )

      7. Briefly describe this strength:_____

3. Check the statement that describes this student's practical or laboratory work the best:
   a. Brilliant, outstanding, always number 1 in the class. ( )
   b. Above average. ( )
   c. Average. ( )
   d. Slightly below average. ( )
   e. Poor, incapable, ill-prepared. ( )
   f. Capable, but careless and slovenly. ( )
   g. Tries very hard but ill-prepared. ( )
   h. Student not known well enough to evaluate. ( )

4. Do you have any adverse comments about this man's preparation before coming to you?
   Yes( )
   No ( )

   a. If yes, make comments here:_____

5. Do you have any significant favorable comments about this man's preparatio before coming to you? Yes ( ) No ( )

   a. If yes, make comments here: _____

   _____

6. How did this man's knowledge of theory rank with the class as a whole?

   a. Superior ( )
   b. Above average. ( )
   c. Average ( )
   d. Below average. ( )
   e. Inferior and handicapping. ( )

7. How would you rate this man's knowledge of mathematics?
   Adequate ( )
   Inadequate ( )

   a. If inadequate, state how: _____

   _____

8. If additional information is desired, do you have available for inspection copies of homework, class records, experiments or any other material that could be used to elaborate upon this evaluation of this student?
   Yes ( )
   No ( )

9. What suggestions can you make that might have improved this student's preparation for your phase of the course?

   _____

   _____

   _____

   _____

   _____

TABLE 3

SCHEDULE FOR SUBMITTING REPORTS ON EXPERIMENTAL AND REGULAR STUDENT EVALUATIONS

Class	Title of subject matter	Rate & report at end of	On date of
XP4-50	Test Equipment	28th Week*	26 Aug **
with	Transmitters	30th Week	9 Sept
1-50	Receivers	32nd Week	23 Sept
	Supersonics (Sonar)	34th Week	7 Oct
	Radar Fundamentals	36th Week	21 Oct
	Radar Equipment I	38th Week	4 Nov
	Radar Equipment II	40th Week	18 Nov
	UHF & VHF Equipment	42nd Week	2 Dec
XP5-50	Test Equipment	28th Week	23 Sept
with	Transmitters	30th Week	7 Oct
1-50	Receivers	32nd Week	21 Oct
	Supersonics (Sonar)	34th Week	4 Nov
	Radar Fundamentals	36th Week	18 Nov
	Radar Equipment I	38th Week	2 Dec
	Radar Equipment II	40th Week	16 Dec
XP7-50	Test Equipment	28th Week	21 Oct
with	Transmitters	30th Week	4 Nov
3-50	Receivers	32nd Week	18 Nov
	Supersonics (Sonar)	34th Week	2 Dec
	Radar Fundamentals	36th Week	16 Dec
XP8-50	Test Equipment	28th Week	4 Nov
with	Transmitters	30th Week	18 Nov
4-50	Receivers	32nd Week	2 Dec
	Supersonics (Sonar)	34th Week	16 Dec
XP9-50	Test Equipment	28th Week	18 Nov
	Transmitters	30th Week	2 Dec
	Receivers	32nd Week	16 Dec

* Refers to week of the regular 42 week course

** All dates 1949

Concluding statement This concludes the description of the activities of the experiment. They involved general direction of the experimental staff by the writer over a period of 44 weeks, 11 weeks of which were spent at U. S. Naval School, Electronics, Treasure Island, San Francisco, California, where the experiment was conducted.

PART III

ACHIEVEMENTS OF EXPERIMENTAL AND REGULAR CLASSES COMPARED

Nature of the comparisons

The plan for the experiment stipulated that the experimental method would be judged superior to the regular method if the experimental students were able to compete successfully with regular students in the equipment phase of the course, provided the experimental students had devoted less time to instruction in the basic electronics phase of the course.

The determination of whether the above stipulations had been satisfied or not required a comparison of experimental and regular students. It was planned originally to base the comparisons on the paired students in the experimental and regular class, but as the experiment proceeded, the ability to make direct comparisons of paired students decreased progressively to a point where accurate comparisons were not possible. The reasons for this decrease were: the more rapid progress of the experimental classes, and the destruction of many pairs by failure and eliminations of a large number of the paired students in the regular course.

TABLE 4

RELATIVE LENGTHS OF INSTRUCTION PERIODS, REGULAR AND EXPERIMENTAL CLASS

Subject	Regular Classes	Weeks instruction XP4-50	XP5-50	XP7-50	XP8-50	XP9-50
Direct current	10	3	4	4	4	4
Alternating current	8	5	6	6	6	6
Basic electronics	8	8	8	8	8	8
Totals	26	16	18	18	18	18

Table 4 indicates a more rapid progress by the experimental classes through the course than the regular class. Class XP4-50 had completed direct an alternating current both before regular class 4-50, which contained the paired students of XP4-50, completed direct current. The whole basic phase was completed by XP4-50 10 weeks before the regular 4-50 class. The same was true of the other experimental classes except that 18 weeks instead of 16 were required to complete the basic portion of the course. Since much of the comparison of the experimental and regular students was based on locally prepared examinations which varied greatly in both content and relative difficulty the problem of obtaining comparable examinations to be administered at dates 8 to 10 weeks apart, militated against accurate comparisons. The problem of obtaining comparable examinations was not present when the experimental and regular groups wrote the same examination at one time, because any discrepancies in comparability would apply to one group as well as the other.

In the equipment phase of the course, it was desired to make direct comparisions of the practical work of the experimental and regular students. Obviously a direct comparison with the paired students in the regular class was impossible because the regular students were 8 to 10 weeks behind the experimental students.

All the experimental students except two completed the experimental instruction without a repeat period of instruction or elimination. One elimination was due to illness, the other was psychotic. The record was not as good for the paired students in regular classes.

TABLE 5

STATUS OF PAIRED STUDENTS OF THE REGULAR COURSE AT COMPLETION OF THE BASIC ELECTRONICS COURSE. (26 WEEKS)

Class	Total Students	Number without two week repeats	Number of two week repeats 1	2	3	4	Dropped from School
4-50	14	6	8	3	0	1	4
5-50	14	7	7	3	0	0	0
7-50	14	8	6	4	1	0	1
8-50	14	9	5	3	0	1	0
9-50	14	9	5	0	0	0	1
Totals	70	39	31	13	1	2	6

Table 5 shows that 31 out of 70 of the paired students in the regular class were given at least one repeat period of instruction. Of the 31 students 13 required two, 1 required three, and 2 required four repeat periods of instruction. In addition, 6 of the 31 were dropped from school before the end of the basic electronics phase of the course.

Obviously, the six students dropped from school destroyed six pairs, 9 percent of the total pairs. Each repeat period placed the student two weeks farther behind his opposite in the experimental class, making direct comparison still more difficult.

If the relative number of students in the experimental and regular classes who had received repeat periods of instruction or were dropped from school were used as a basis of evaluating the experimental method, a picture favorable to the experimental method out of proportion to its true value would be obtained. If the experimental method is capable of reducing repeat periods of instruction and eliminations to a near zero value, it is a testimonial in favor of the exper-

imental method. But, this does not yield a satisfactory answer to the question as to whether standards of instruction have been sacrificed or not. Therefore, i was necessary to devise other means of comparison.

The means of comparison employed, consisted of selecting a regular class whi had completed instruction in subject matter comparable to that of the experimenta class and administer a comprehensive examination to both the classes. As an exa experimental class XP4-50 completed alternating current with regular class 1-50, the latter having started instruction 10 weeks before the experimental class. examination was given and the results compared. Class XP4-50 finished this inst tion the same time regular class 24-49 finished basic electronics in the regular course. Comprehensive examinations were given to both classes and the results compared. Class XP4-50 was combined with regular class 24-49 and received 16 we of instruction in the regular course. During the 16 week period, the experimen students were compared with the regular students in theory and practical work.

The procedure used in comparing the experimental and regular classes employe with class XP4-50 was repeated with each succeeding experimental class. In summa the procedure was for the experimental classes to write competitive examinations with a regular class who had completed a comparable course of study. In the equipment phase of the course, the experimental class was combined with a regular class, received 16 weeks of the regular instruction and were compared to the stud in the regular class by written examination and instructors evaluation of practi work.

The regular classes with whom the experimental classes were compared were co parable to the experimental classes in so far as GCT, education, experience and were concerned.

TABLE 6

MEANS AND STANDARD DEVIATIONS OF GCT SCORES OF EXPERIMENTAL AND REGULAR CLASSES

Regular Classes			Experimental Classes		
Class	M	S.D.	Class	M	S.D.
23-49	66.7	4.4	XP4-50	66.3	4.5
24-49	64.6	6.5	XP5-50	67.0	4.5
25-49	65.1	3.9	XP7-50	66.1	6.8
1-50	65.8	4.1	XP8-50	66.9	3.9
2-50	66.4	3.5	XP9-50	65.5	4.6
3-50	66.6	5.2			
4-50	66.0	5.3			
5-50	65.4	5.7			

Table 6 lists the regular classes with which the experimental classes were compared. The table indicates that no significant difference in GCT scores exists between the experimental and regular classes.

In forming the experimental classes, all students with previous education or experience in electronics, electricity, or other related courses were declared ineligible. Since the comparison of experimental and regular classes was a comparison of relative learning under two different systems of instruction, the inclusions of students with previous training or experience in electronics in the regular class would distort the results. Therefore, the grades and records of those students were eliminated from the comparisons. The identification of students who possessed this training was made by an inspection of the students' permanent records.

The experimental and regular students are compared in three ways, by means of (1) examinations in basic electricity and basic electronics during the experimental instruction, (2) examinations and evaluation of the students' work in the equipment phase, and (3) the numbers of repeated and eliminated students during the whole course.

The examination used at the end of basic electricity was the Bureau of Naval Personnel, 18th Week Comprehensive Examination[1] covering shop practices, direct current and alternating current. This was a 70-item, multiple-choice examination. It contained about 20 items not specifically covered in the experimental course, particularly in shop practices.

Two examinations were used at the end of the basic electronics course, the Special Bureau of Naval Personnel Special Electronics Examination explained in Chapter 7, and the regular 26th Week, Treasure Island, Examination. The latter examination was similar to the Bureau of Naval Personnel Special Examination in most respects.

The purpose of the comparison in the equipment phase was to show the status of the experimental classes with 8 to 10 weeks less prior instruction in relation to the students trained in the regular course. The comparison employed the Null Hypothesis[2] as a vehicle, the typothesis stating that differences in groups do not exist unless evidence definitely established one group superior to the other. To test the typothesis, each experimental student and each regular student was rated at two-week intervals throughout the equipment phase of the course. The ratings were based on the locally prepared, biweekly examinations, and the Student's Evaluation Form. Both the examinations and ratings were done by the instructors in the equipment phase. The examination grades in raw form, and the Student's Evaluation Sheets were submitted to the writer for computations. If the computations revealed no significant differences, the experimental method was judged a superior method of training since less time was required by the experimental students for

1. This examination is confidential.
2. H. E. Garrett. Statistics in Psychology and Education, (New York), Longmans, Green and Company.

instruction in the basic electronic phase of the course.

To obtain a basis of comparison of repeat periods of instruction and eliminations from school, the records of 30 regular classes graduating between 1 July 1948 and 31 July 1949 were examined. The students involved were about 1100. The number of repeats and eliminations were tabulated, translated into percentages and are recorded in Table 7. The first column shows the mean percentage of repeat and eliminations for the whole course. The second column shows the standard deviations. Column three shows the part of the percentage of repeats and eliminations occurring during the first 26 weeks of the course, and column four shows the part occurring during the last 16 weeks.

TABLE 7

REPEATS AND ELIMINATIONS AS PERCENTAGES OF THE TOTAL NUMBER OF REGULAR STUDENTS IN 30 REGULAR CLASSES GRADUATING BETWEEN 1 JULY 1948 AND 31 JULY 1949. (Number involved was 1100)

	42 Weeks Mean Percentage	S. D.	Weeks 1 - 26 Mean Percentage	Weeks 27 - 42 Mean Percentage
Repeats	163.6*	48.9	131.0	32.0
Elimination	25.3**	16.1	19.6	5.7

* Range, 46.7% to 277.9%
** Range,) to 79.3%

Table 7 indicates that during the 42 weeks of instruction, the repeats were 163.6 percent of students enrolled. That means for every 100 students enrolled, there were 163 repeats given, enough for one repeat for each student, and a second repeat for 63 students. Of the 163 repeats, 131 occurred during the first 26 weeks of the course, and 32 during the last 16 weeks.

The eliminations from school for the 30 regular classes were 25.3 percent of the students enrolled. Of this percentage, 19.6 percent occurred during the first 26 weeks, and 5.7 percent during the last 16 weeks. That means for every 100 students, about 20 were eliminated by the end of the 26th week and 6 were eliminated during the last 16 weeks.

Summary of Achievements of the Experimental Classes in Equipment Phases

With all five experimental classes, as revealed in Table 8, about an equal percentage of experimental and regular students were rated as above average, average, and below average in the several aspects of the equipment phase of the course. The differences that do exist are not significant at the .05 level of confidence. Since the experimental students had received considerably less previous instruction, it can be concluded that the experimental method was responsible for this achievement.

The number of experimental students receiving a two-week repeat period of instruction in the equipment phase of the course, was a little larger than that of the regular course, however, with the exception of two students being dropped from the experimental classes, none of the experimental students were repeated or dropped prior to the equipment phase of the course, meaning that all students, strong and weak entered the equipment phase of the course. For the regular classes, during the past year, over one-fourth of the students have received one or more repeat periods in the first 26 weeks of the course. That means a considerable number of the students will have had 28, 30 or 32 weeks of instruction prior to the equipment phase of the course. Of the total students in the regular classes, about one-fifth were eliminated from school for all causes, and of these, only a very few were for reasons other than scholastic ones. Thus the members of the regular classes with whom the experimental students were in competition in the equipment phase of the course were the survivors after the poorest 25 per cent had been eliminated. A considerable number of these survivors had received instruction in excess of twenty six weeks. In effect, the experimental classes with all students, strong and weak, after 16 and 18 weeks of prior instruction, were able to compete successfully in the equipment phase of the course with screened regular classes, containing students who had received a minimum of 26 and in some cases as much as 32 weeks instruction prior to this phase of the course.

TABLE 8

UMMARY OF COMPARATIVE BIWEEKLY GRADES AND RATINGS FOR EXPERIMENTAL AND REGULAR CLASSES. EQUIPMENT PHASE OF COURSE.

Subject		With class XP4-50		With class XP5-50		With class XP7-50		With class XP8-50		With class XP9-50	
		XP	REG	XP	REG	XP	REG	XP	REG	XP	REG
Weakness,	Yes	16*	25	10	16	9	17	2	12	3	3
Evidence of	No	84	75	90	84	91	83	98	88	97	97
Strengths,	Yes	18	18	12	10	15	2	5	3	0	0
Evidence of	No	82	82	88	90	85	98	95	97	100	100
Practical											
Work,	AB	26	21	16	13	30	16	33	17	12	12
Ability in	A	55	57	63	59	46	55	63	54	62	72
	BA	19	22	21	28	24	29	4	29	26	16
Previous	Yes	3	5	3	1	2	1	0	3	0	0
Training,	No	97	95	97	99	98	99	100	97	100	100
Adverse											
Comments											
Previous											
Training,	Yes	1	2	0	0	5	1	0	0	0	0
Favorable											
Comments	No	99	98	100	100	95	99	100	100	100	100
Theory,	AB	23	22	18	17	32	18	52	23	14	14
Knowledge	A	65	57	60	58	45	46	35	35	52	56
of	BA	12	21	22	25	23	36	13	42	34	30
Mathematics	AD	97	96	100	100	100	100	100	100	100	100
Knowledge											
of	INAD	3	4	0	0	0	0	0	0	0	0
Biweekly	M	75.5	75.7	76.0	71.8	78.2	74.1	84.7	74.5	64.0	64.9
Marks	SD	9.3	10.0	9.4	11.6	12.1	11.0	8.6	12.2	13.4	12.7

All values expressed in percent
M - Mean
SD - Standard deviation. RLS combinations.

The importance assigned by the instructors of the equipment phase to the written biweekly examination is evident from the number of students who were rated as average or slightly below in practical work, but were failed in a two-week period of instruction because of poor grades in the written examination. The practice of assigning of greatest importance to written examinations is consistant with the practice in the other portions of the regular class A course, and described in chapter II, but is inconsistent with practice in experimental method. It is possible that if greater credit were given for practical work, fewer students, both experimental and regular, would have received repeat periods of instruction.

The waning interest of some of the experimental students was revealed by the instructor's comment. The loss of interest was probably responsible for the poor showing of some of the experimental students. Since the instruction in the equipment phase was conventional, the absence of the continuing interest of a single instructor probably was responsible to a degree for the failing interest. It is believed that if the experimental method had been used in the equipment phase of the course, the failures that resulted principally from lack of interest by the students could have been lessened.

TABLE 9

SUMMARY OF THE COMPARISONS FOR THE EXPERIMENTAL AND REGULAR CLASSES

Item of comparison	Experimental Classes				
	XP4-50	XP5-50	XP7-50	XP8-50	XP9-50
18th Week Examination	Almost Comparable	Almost Comparable	Almost Comparable	Comparable	Not Comparable
26th Week Examination	Comparable	Not Comparable	Comparable	Comparable	Comparable
Special Examination	Comparable	Comparable	More than Comparable	More than Comparable	Almost Comparable
Equipment Phase	More than Comparable	Comparable	More than Comparable	More than Comparable	Almost Comparable
Repeats (Per Capita)	.35*	.71*	.57*	None	.21*
Eliminations (Percent)	None**	None**	14**	None**	7**

* Per capita repeats for 30 regular classes was 1.63

** Percentage of eliminations for 30 regular classes was 25.

The summary of comparisons of the experimental and regular classes given in able 9 shows the experimental classes as being comparable to the regular classes n most aspects. The reduction of the number of repeat periods of instruction rom 1.63 per student to .37 was significant, and all of these repeat periods came n the equipment phase of the course when the classes were receiving instruction by he regular method.

Of particular significance is the fact that only 4 percent of the students n experimental classes were eliminated in comparison with 25 percent in regular lasses. There is reason to believe that the rate of eliminations could be re- uced still farther if the experimental method were extended to the equipment hase of the course.

The reduction in instruction time from 42 weeks to 32 with one class, and 4 with the other four, is an economy of both men and money. The fact that a tudent is placed in gainful employment 8 to 10 weeks earlier is a major achieve- ent when it is realized that the maximum length of the gainful employment is 90 eeks. The reduction in instruction time by approximately one-fourth will make a roportional reduction in the cost of operating the training establishment. he shorter course will reduce the number of instructors needed and make them vailable for duty in ships and operating stations.

Finally the reduction in number of repeats for the experimental students hortens the course length from 44 or 46 weeks for the students that were repeated o approximately 36 weeks. Based on the data given in Table 7 and assuming normal robability; for every 100 students entering the regular course, 100 will receive 2 weeks of instruction, 41 will receive 44 weeks instruction due to one repeat, 8 will receive 46 weeks instruction due to two repeats, and one will receive 48 eeks instruction due to three repeats. If the number of students receiving the argest number of repeats is reduced by the 25 eliminations, for each 100 students

entering, the graduating class will contain 10 students who received 42 weeks instruction, 41 students who received 44 weeks instruction, and 24 students who received 46 weeks instruction. In comparison, for every 100 students entering instruction and taught with the experimental method 63 will graduate with 34 weeks instruction, 25 with 36 weeks instruction, 8 with 38 weeks instruction, and 4 will be eliminated.

PART IV

CONCLUSIONS

Explanation of performance

The preceeding parts indicate that the experimental classes performed the work of the equipment phase of the course satisfactorily in comparison with the students of the regular course. There was no evidence to indicate that the experimental classes originally were superior. Therefore, it seems to assure that the performance of the experimental classes in the equipment phase of the course was due to improved methods of instruction in the experimental phase of the course.

It is believed that several factors contributed to the improved methods. The more important of these will be discussed briefly.

Improved scheduling

Improved scheduling appears to be a factor in the improved methods. It has been pointed out that in the regular course a large amount of time was being devoted to review and examination, a total of about 20 percent of the instructional time. Although staff size should have permitted a student-instructor ratio of 15 to 1, this had not previously been realized. The scheduling of lectures on theory, laboratory, and mathematics instruction had not been coordinated adequately. The experimental method appears to have overcome these difficulties.

The experimental method did not use the practice of allocating two days out of ten to review and examination. The time saved was used for more appropriate teaching-learning activities. Reviews and examinations were used, but the procedures were different. No special day of the week was scheduled for review, since reviews used specifically to prepare students for examinations were believed to promote only temporary learning. The experimental method employed continuous reviews to level off the curve-of-forgetting, instead of seeking to peak the curve for a temporary need.

In the experimental method, a day's work opened with a review of the preceding work. A new topic was introduced with a review of the old. In this way, the work done by the student was self-reviewing, since the student employed in his work the subject matter that he had learned. The student was constantly required to apply what he had learned. Such application provided a more effective review than the discussion of abstract principles.

Frequent and brief examinations were used in the experimental method. Examinations became teaching devices. Students examined their answers to discover strengths and weaknesses, and were able to get needed assistance from the instructor. Examinations used to determine grades utilized only a small part of their potential teaching value. This is especially true when students do not have an opportunity to review the examinations after writing them.

In the experimental method grades were determined by evaluations, (including brief examinations) of the day by day work of the student in all the aspects of the class work. Major examinations were given at the end of large units like direct current, alternating current, but these examinations served chiefly as devices to evaluate the instruction.

For some time the Bureau of Naval Personnel had been assigning instructors on the basis of one for each ten students. However, scheduling in the regular course was such that classes of 60 students were common for lecture and mathematics instruction. In the laboratory, the two-lectures were supposed to assist the laboratory instructor, but scheduling was such that usually only two of the three were available. Thus, as far as instruction was concerned, the actual ratio in the classroom was often 60 to 1, and in the laboratory, 30 to 1.

Since the total assignment of instructors by the Bureau of Naval Personnel must cover those assigned to equipment maintenance, relief duty, and administrati-

functions, it is impossible to realize a student-instructor ratio of ten to one in the classroom. It should be possible, however, to realize at least a fifteen to one ratio. In the experimental method a fourteen to one ratio was achieved.

Combining lectures on theory, mathematics and instruction and laboratory work in a single room under the direction of a single instructor, made functional teaching possible. It is believed that this was one of the most important contributions to the improved method. Functional teaching is essentially a procedure of teaching what is needed, in the amounts needed, when needed. Combining theory and practical work made it possible for the student to engage in activities that simulated work situations. Thus, a close relationship between learning activities and needs was established.

Teaching that is closely related to student needs tends to eliminate unnecessary subject matter. The experimental method demonstrated this by showing that a considerable amount of subject matter could be omitted without lowering the efficiency of the graduates.

Mathematics Instruction

The assumption that the mathematics needed by an electronic technician could be taught along with the theory and practical work was proved by the experiment. In only the radar fundamentals phase of the course was there any complaint concerning inadequate preparation in mathematics. Investigation revealed that this was confined to a specific application not understood by the students. In all other phases of the equipment portion of the course students seemed to have an adequate command of mathematics skills.

The significance of this situation should not be overlooked. In the regular course, 120 hours were devoted to the presentation of mathematical problems. Teaching mathematics as an integral part of the experimental method accounted for a considerable part of the total saving in instructional time.

Modified Classroom

The favorable class size, and the arrangement of the classroom are believed to have contributed significantly to the improvement of instruction by enabling the instructor to move with ease from one student to another with minimum disturbance to others. The classroom, and the class size made it possible for the instructor to give maximum attention to the individual students, thereby better adjusting the instruction to the needs of the individual.

This experiment has shown that it is possible to achieve equally good results by methods that permit a 26 to 30 percent reduction in instructional time. This is very important to the Navy.

Most men up to the last year were on three-year enlistments. A relatively small number reenlist. Under the regular instructional procedures the Navy could not expect more than approximately 90 weeks of gainful employment from an electronic technician. The men with four-year enlistments increase their gainful employment by about 10 months. The experiment indicates that by adopting better instructional methods this could increase by 10 to 15 percent for graduates, and if the lower attrition were considered, the gain may be approximately twice that amount. Although the experiment indicates potential savings in the number of instructors needed in service schools, as well as a saving in the cost of instruction, the most significant contribution is probably to be found in its power to increase very significantly the productivity of skilled men

TOTAL MANPOWER POTENTIAL FOR WAR

Albert Kay
Munitions Board

Prepared for
THE WORKING GROUP ON HUMAN BEHAVIOR
UNDER CONDITIONS OF MILITARY SERVICE

Department of Defense
Research and Development Board
Washington 25, D. C.

June 30, 1951

TOTAL MANPOWER POTENTIAL FOR WAR

by

Al Kay -

Munitions Board

Manpower may very well be the ultimate limiting factor in our nation's potential to wage an all-out war. In considering the problem of manpower, a differentiation must be made between total population, and that part of the population used as effective manpower. In a period of mobilization, the manpower goal must be to engage most effectively the maximum proportion of the population directly or indirectly in the defense effort. The effectiveness of this maximum proportion will vary according to the way it is used. It is conceivable that all persons over 14 and under 70 years of age could be engaged in the war effort, yet, because of poor utilization practices, be considerably less effective than a smaller group being utilized to its full potential.

In evaluating the manpower resources of this country, it is important to compare them with those obtaining 10 years ago, the period just before our entrance into World War II. Striking changes in the size and composition of the population have occurred during the past decade which have significantly affected the availability of manpower for the national defense effort. Although total population increased by 20 million, or about 15 percent, the proportion between the ages of

and 64 years increased only about 13 percent while the proportions
ıer 9 years and over 64 years increased over 43 and 29 percent,
spectively. In other words the "productive" part of the population
ıt now support a relatively larger "unproductive" group. Further-
re, the numbers between 10 and 19 years of age, which will constitute
e bulk of the new entrants into the population of military and working
e during the next decade, actually decreased by 2 million.

This inventory of our human resources shows that our population
owth over the last decade has been disproportionate in that the groups
eded most by our military and civilian labor force have increased the
ast. The population as a whole has grown older. The longer range
plications are more comforting in that the increase in birth rates
ring the past decade will greatly enhance our military and production
otential during the 1960's.

Manpower resources can be much more realistically appraised by
sing the labor force, rather than total population, as a measure.
he labor force is defined as those persons 14 years of age and over
ho are working or seeking work. In December 1950, 64,670,000, including
hose in the armed forces, were in the labor force. About 60.3 million
ere employed in civilian activities and 2.2 million were unemployed.
Naturally, the great majority of the almost 48 million persons not in
the labor force were women. In fact, only 1/5 of all men 14 years and
over were not in the labor force, with most of them being either in school
or retired. In contrast, about 2/3 of all women were not in the labor
force; most of these were keeping house. As compared with 1940, certain

significant changes have occurred in the total labor force picture. The labor force has grown faster during the decade than the population from which it is drawn. The proportion of males in the labor force has increased only slightly but the proportion of females has risen sharply, thus leaving a smaller expansion potential than in 1940.

War induces an abnormal change in the labor force, as recent experience demonstrated. Under the pressure of World War II mobilization large numbers of "extra" workers were recruited into the labor force. As a result, in April 1945, the labor force, at 66.2 million, included about 8 million more workers than would normally have been expected. Women accounted for 4 million or about half of the "extra" workers. About 2 million were teen-age boys, reflecting the movement of youth into the armed forces or civilian jobs, and the remainder consisted of adult men who otherwise would not have been in the labor market.

It is estimated that the yield of "extra" workers from the present population could attain a level of only 5 million under all-out war conditions similar to those prevailing at the end of World War II. Higher current participation of women in the labor force, as compared with 1940, plus higher marriage and birth rates have reduced the number of additional women that could be induced into the labor force, although the estimates of the total "extra" force still provide that about half would be composed of women. Any further increase above the resulting 70 million labor force would be accomplished only by drawing more heavily from such groups as mothers of very young children or from high school students.

Thus the maximum gross number of persons who could be mobilized appears to be in the neighborhood of 70 million. This figure, naturally, would not be attained during the first six months of a conflict but would take place in progressive increments as the size of the armed forces and the war production load increased. The rate of increase of the total labor force would be less than the rate of increase of the armed forces, with the result that the civilian labor force would be reduced at progressively increasing rates. A hypothetical pattern of change, based on World War II experience, indicates that by the time the armed forces have increased to 12 million which is close to top World War II strength, the civilian labor force would be reduced by 5 million to a total of about 58 or 59 million. It is evident that parts of the present production pattern of civilian goods and services will have to be curtailed. It is also evident that, since manpower will be in short supply, the fullest possible use must be made of every available person.

The equating of the resources and requirements shown above must be considered as a frame of reference for discussing manpower potentialities in general terms. In actual mobilization planning the demand aspects of the problem are ascertained by determining the specific requirements for military end-items and the time-phasing of the build-up of the armed forces. End-time requirements are then translated into manpower which, taken together with requirements for maintaining the civilian economy, will facilitate a more accurate appraisal of manpower needs.

In the meantime, it is urgent that current effort be expended toward improving the utilization aspects of the problem. Studies should be made of the occupational requirements with a view toward determining the type of personnel that can be used in each occupation. This is especially important for those occupations which are in critically-short supply and which require lengthy training time. In this connection it is also necessary that special attention be focused on ways and means of utilizing potentially useful personnel such as women, minority groups, and those with physical deficiencies. Studies should also be made of methods and techniques for measuring the attainments, skills, and aptitudes of members of the labor force. By adopting sound utilization policies the effectiveness of the total labor force can thus be expended.

FATIGUE AND MONOTONY

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FATIGUE AND MONOTONY

- John L. Kennedy -

ABSTRACT

Modern research studies on human fatigue emphasize the importance of motivation, monotony and vigilance as variables rather than exhaustion or continuous decrement of performance in time. The characteristic sign of human fatigue is a lapse in vigilance in an otherwise adequate performance. The prototype of this type of fatigue is the missed signal by the search radar operator or the motor vehicle operator who runs off the road in a well-lighted stretch of good highway.

Studies of these situations suggest that the human operator is good for about one-half hour on certain monotonous jobs before serious lapses in vigilance occur. Several ways of overcoming these losses in vigilance are considered.

Modern research on fatigue in the normal human adult has
ıe to emphasize the psychological variables of monotony,
ivation and vigilance rather than the concept of gradual
rement of performance in time. "The pattern of human fatigue
given in these experiments is thus seen to be one of periodic
cks or interruptions in performance of varying frequency and
ation rather than the continuous decrement as shown in the work
ve, secured in the study of isolated muscle groups." (1, p. 695)
s paper will review three recent research programs on fatigue
l monotony, (1) the British studies by Mackworth, (2) the
itman studies from the University of Chicago, (3) the Tufts
lege studies. These three programs represent, respectively,
psychological, the physiological and the psyshophysiological
roaches to this complicated problem. An excellent comprehensive
iew of other studies may be found in Finan, Finan and Hartson (2).

Mackworth (3) has recently prepared a summary of his many
eriments on "vigilance". He uses the term vigilance "to describe
tes which would appear to be psychological rather than physio-
ical". He has designed experiments to get at the way the readi-
s of the subject to respond adequately in the "search" situation
ies as a function of time. He reports the use of three kinds
test situation, (1) the Clock Test, in which the subject is
uired to signal the occurrence of a double-jump of a pointer
ing on the face of a large clock. The pointer jerked to a new
ition once every second. The double-jumps occurred 12 times in
minutes "randomly" distributed over the 20 minutes; (2) the

Synthetic Radar Test, a simulation device in which an echo could be supplied on the screen in noise at irregular intervals. The subject's taks was to signal tho appearance of a target as soon as he perceived it; (3) the Listening Test, which was similar to the Clock Test except auditory rather than visual signals were used. The subject sat in a sound-proof room, listening with a pair of headphones to the tones produced by the apparatus. The signal the subject was required to identify was a sound of 2.25 sec. duration as opposed to the standard duration of 2.0 sec.

The summary provided by Mackworth is an excellent one. To quote:

Clock Test Conclusions

1. Substantially more signals are missed by the subjects after they have been working for half an hour at the task.
2. This decline can be prevented by a rapid alternation of watch-keeping duties with some other work. Half an hour on and hali an hour off is required, since one hour spells are too long i this falling off in performance is to be avoided.
3. The deterioration in accuracy can also be prevented by supply-ing knowledge-of-results during the test period.
4. A sudden telephone message in the middle of the test spell produces a temporary improvement which lasts for only half an hour.
5. Briefing the subjects beforehand to watch very carefully duri a given period of the test does not affect the missed signal trend at all.

6. On the other hand, 10 mg. "Benzedrine" (amphetamine sulphate) taken by mouth one hour before the start of the test successfully maintains the initial level of accuracy over the whole two hours of the test. This is a pharmacological effect and is not due to any possible suggestion effect of knowing that one has taken some tablets which might affect efficiency.

7. No end-spurt is obtained towards the end of the two-hour test spell because time-estimation is very faulty under these circumstances, and most subjects imagine that there is still some time to go when the two hours are up.

8. In the last three half-hours of a two-hour test, the proportion of missed signals is usually twice, or even three times, as great as that when the men are working at their very best.

9. Accuracy can be decreased by presenting the signals in a high atmospheric temperature.

10. Deterioration can also arise when the subject is expecting a telephone message while he is doing the Clock Test.

11. People differ greatly in their ability in the Clock Test, but this is not related either to visual acuity or to group intelligence test score. There is no known reason for these differences. (Other conclusions on the Clock Test are not quoted)

Synthetic Radar Test

1. When the difficulty of the Synthetic Radar Test is roughly equivalent to that of the Clock Test, after a period of half an hour has elapsed the subjects begin to deteriorate in their efficiency in responding to signals. This similarity between the half-hour to half-hour trends in the Clock and Synthetic

Radar Tests justifies the general concept of a visual vigilance situation.

(Other conclusions from the Synthetic Radar Test not quoted)

Listening Tests

1. The Main Listening Test gives a half-hour by half-hour downward trend in accuracy which is very like the curve obtained from the Clock and Synthetic Radar Tests, given that the tasks are all of equivalent difficulty.....
2. This resemblance between the results from two different auditory vigilance tests and those from two visual vigilance tests indicates a common cause for the change in behavior. It is concluded that this arises from some cerebral process, rather than from any local alterations in the peripheral mechanisms of either the eyes or the ears. The finding suggests that some central process in the brain is responsible for watchfulness.
3. During auditory vigilance tests (as in the visual vigilance experiments) the classic reaction times are usually greatly exceeded and response times of one or one and a half seconds are the rule.

(Other conclusions not quoted)

It seems to the present writer that these studies go far to answer the practical problem of "how long can a man work on a uniform monotonous job without making dangerous errors?" The over-all rough average seems to be one-half hour for lookouts, search radar operators and listeners, whose duties consist of

remaining vigilant enough to pick up an unexpected change in the visual or auditory environment.

Mackworth offers no explanation of these lapses in vigilance beyond the general statement that they appear to be a function of some central process in the brain. Kleitman (4) has demonstrated that diurnal fluctuations in body temperature in man are related to and can be used as indices of efficiency as measured by speed and accuracy of performance. Kleitman proposes that there are diurnal temperature "types" of people, for example, the "morning type", who reaches his maximum temperature early in the day as opposed to the "evening type", whose maximum body temperature is reached toward the end of the waking period. Kleitman's recent work on submarine crews shows that it is possible to arrange watch-standing periods to coincide with maxima of the diurnal temperature curve and thus increase efficiency.

The final work to be reviewed (3) (6) had as its goal the development of techniques for protecting personnel from lapses in a monotonous, long-continued task. If it is not feasible to change operators of radar scopes every half hour, how can the operator be protected from these lapses? Kleitman's results suggest that raising body temperature might help. A more direct approach to the problem might be to warn the operator of an approaching "low" period by putting an automatic signal into the situation. One needs to have the signal operated by a delicate psychophysiological indicator of the state of the subject. Travis and Kennedy (3,6) have reported the development of an "Alertness

Indicator", which is operated by muscle action potentials recorded from electrodes placed on the forehead of a subject. Changes in amplitude of the integrated action potentials are related to the vigilance of the subject as demonstrated by a reaction time criterion in several monotonous situations. Work is still underway to develop a reliable, portable, comfortable, easy-to-operate device for general use. The present models provide an automatic warning signal to the operator whenever his muscle tension drops below a pre-set level. They do not entirely solve the practical problem of interference or noise as a source of signal, which results in some false indications in some applications outside the laboratory

Conclusions

The following conclusions may be drawn from the information presented:

1. Personnel vigilance is at a premium in many practical military situations.
2. An observer in a monotonous situation of the Clock Test type may be expected to start making errors after about half an hour of continuous operation.
3. It may be possible to utilize selection procedures to increase efficiency in such situations, i.e., to identify when body temperature peaks occur in the day for each observer and put him on duty at a time appropriate to his body temperature type.
4. It may be possible to "monitor" the operator continuously in monotonous situations and warn him automatically of an approaching lapse period.

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