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EXPLORATORY RESEARCH ON COMMUNICATION ABILITIES AND CREATIVE ABILITIES.

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DESCRIPTORS- \*COMMUNICATION SKILLS, COMMUNICATION PROBLEMS, CREATIVITY RESEARCH, \*MILITARY PERSONNEL, MILITARY TRAINING,

THIS STUDY SOUGHT TO IDENTIFY VARIABLES RELATED TO EFFECTIVENESS OF COMMUNICATION IN MILITARY OPERATIONS. THE GOAL WAS TO DEVELOP TESTS TO CLASSIFY OFFICERS AND AIRMEN, BASED UPON ALL OF THE BROAD COMMUNICATION ABILITIES NEEDED IN THE AIR FORCE. THE RESEARCH OUTLINE CONSISTED OF REVIEWING COMMUNICATION STUDIES AND OTHER TESTS, PREPARING A REDUCED BATTERY, AND ANALYZING THE DATA. THESE BATTERIES OF SCORES WERE USED--(1) BATTERY A (APTITUDE TEST SCORES), (2) BATTERY B (PERSONALITY AND SELF-REPORT SCORES), AND (3) BATTERY C (PREDICTOR AND SITUATIONAL CRITERION SCORES). SEVERAL HYPOTHESES WERE DRAWN PERTAINING TO EXISTING MEASURES AND INVOLVING NEW INTELLIGENCE AND PERSONALITY MEASURES. THE RESULTS INDICATE THAT MANY MEASURING DEVICES COULD BE IMPROVED. COMMUNICATION ABILITIES ARE HIGH-LEVEL SKILLS UNDERLYING MANY IMPORTANT ACTIVITIES AND COMPRISING A VAST AREA INVOLVING A LARGE NUMBER OF VARIABLES. AS A RESULT OF THIS STUDY, A STANDARD SET OF COMMUNICATION ABILITIES AND TRAITS WHICH UNDERLIE SUCCESSFUL PERFORMANCES ACROSS TYPICAL COMMUNICATION TASKS IN AN ORGANIZATION WERE IDENTIFIED. (PH)

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# EXPLORATORY RESEARCH ON COMMUNICATION ABILITIES and CREATIVE ABILITIES

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**EXPLORATORY RESEARCH ON COMMUNICATION  
ABILITIES AND CREATIVE ABILITIES**

**by**

**Calvin W. Taylor, Brewster Ghiselin,  
and Kan Yagi**

**Including some unpublished materials by Calvin W. Taylor,  
William R. Smith, Brewster Ghiselin, Boyd V. Sheets, and  
John R. Cochran from a previous Air Force project on commu-  
nications abilities in military situations.**

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## PREFACE

This project carried out under Grant # AF-AFOSR 144-63 with the University of Utah is a continuation and an expansion of a previous project reported by Calvin W. Taylor, William R. Smith, Brewster Ghiselin, Boyd V. Sheets, and John R. Cochran, Identification of Communication Abilities in Military Situations, WADC-TR-5892, Wright Air Development Center, Personnel Laboratory, Lackland Air Force Base, Texas, June 1958, 67 pp.

In addition to the authors of the present report and the authors of the preceding report, others who assisted in the present project were Robert Ellison, Larry James, John Branum, and Judy Nielsen. We are especially indebted to Connie Tramell Jensen for her help throughout the project and for her typing of the final report.

During the course of the project, opportunities arose to use this research information in various ways. For example, a speech was given to the Federal Council for Science and Technology at their Second Symposium on Technical Information and the Federal Laboratory, April 13-14, 1964. This speech entitled "Information and Scientific Creativity" by Calvin W. Taylor, is now published in their symposium report, pages 26-33. A chapter entitled "Productive Thinking in Science Education" was also written by Calvin W. Taylor for a forthcoming National Education Association publication (edited by Robert Uffeimann) on Science Education at the Junior High Level. Lucille Hunter, a teacher in a local school district, integrated some of these communication tests and other adaptations and ideas of her own into an English Arts program in her classroom and completed her thesis on these materials (Hunter, 1964). She also oriented new teachers coming into her district about her new materials and approaches. Recently the Granite School District, which has the largest enrollment of any district in Utah, initiated a large study in their Title I program designed to reach the educationally deprived in which communication tasks and training exercises adapted from these communication studies were implemented. The major impetus for this study came from the research accomplished and reported here. In addition to their final report, a masters thesis by Larry James (1967) has recently been completed.

Computer time was made available without charge by Numerical Analysis Research, University of California, Los Angeles, for work on the SWAC; and by Western Data Processing Center, UCLA for work on the IBM 709 and 7090.



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## CHAPTER I

### INTRODUCTION

Both the integrity and the efficiency of a society depend on the power of its members to communicate with one another. In a society of considerable size, the system of communication is of prime importance. Likewise the vital functions of a large or widespread organization with central control are directed through its communication system. Because of our strong hunch that the major source of variability and error in the communication system lies ordinarily in the human being rather than in the physical apparatus of the system, a first requirement for ensuring effective communication is to identify the human abilities involved in good communications--in other words, to study the individuals and their various communication abilities as they function in the total communication system in an organization.

Communication abilities are interpreted as comprising those behaviors which affect transmission of intelligence among people, through either direct or indirect means. For the broad exploratory purposes of this project, the domain of behavior in communication was divided into four primary areas: reading, listening, talking, and writing. The major emphasis in this study is on the expressional abilities--that is, on writing and talking. Whenever we mention speaking abilities we certainly do not limit ourselves to the very narrow realm of public speaking but we mean the many, many things that are much better described as talking abilities.

The focus was much more on human processes and abilities rather than upon the messages that were formulated, modified, or transmitted by these processes. However, almost all activities studied were concerned mainly with communicating by use of words, and not other aspects or activities such as non-verbal communicating.

#### The Problem

More than a decade ago the Air Research and Development Command, Air Force Personnel and Training Research Center, Lackland Air Force Base, San Antonio, Texas, awarded contractual funds to the University of Utah for the purpose of conducting a study, the main intent of which was to use current psychological methodology "to identify variables related to effectiveness of communication in military situations." The practical goal was to develop tests for operational use which could effectively determine classification of both officers and airmen for duty, based upon all of the communication

abilities needed in the large complex organization of the Air Force. At the outset, we hardly realized the complexity and immensity of the problem. In the initial phases of the study it became apparent that we could only do some wide exploratory work and could not hope to clarify the whole subject. Throughout our report, we shall attempt to point out many remaining areas of obscurity.

The research project as viewed initially involved (1) a brief review of related research, (2) an analysis of the communication requirements in Air Force job specialities, (3) a comprehensive formulation of hypotheses believed to underlie the various communication processes, (4) two comprehensive studies of Batteries A and B using predictive tests of ability and personality variables that were expected to be related to communication behaviors, and (5) an extensive Battery C validation study of selected predictor tests, using multiple situational test criteria.

The research outline comprised a sequence of eight broad phases. We planned to (1) review studies pertaining to communication abilities; (2) list variables having a rational relationship to communication abilities; (3) assemble previously constructed Air Force tests and other relevant tests; where necessary, construct new tests of postulated variables, revise currently available Air Force tests and, in general, proceed to prepare a trial battery of tests likely to predict effective communication performances in military situations; (4) determine the reliability of each test in the battery and reduce the predictor variables to a more parsimonious number by means of factor analysis or related techniques; (5) prepare a reduced battery by eliminating tests which overlapped excessively; (6) develop between eight and fourteen military-type laboratory situations in which communication skills were to be measured; (7) administer the predictor tests and the criterion situations to not less than 60 subjects; and (8) analyze the data in order to develop generalizations concerning the relationship between the abilities measured and communication skills in military situations.

The outline above was expanded in some areas so that the research might be conducted more fully and efficiently. In fact, the research team proved to be so productive in generating ideas for new tests that it became necessary to assemble two predictor batteries, rather than one, for experimental purposes. As a consequence two large samples were tested in the early phases in order to try out all predictor tests. Between these two batteries there were 104 different scores--41 that were common to both batteries and 63 scores that were different. The situational test phase was also affected by the fruitfulness of the researchers, so that more than the required number of situational scores were obtained. Twenty-seven scores from eighteen situational tests provided an

elaborate multiple set of criteria against which the selected predictors were to be evaluated. In each of the three empirical studies, the samples tested were larger than the minimum number required, far exceeding this minimum in the first two studies.

It was felt that the domains involved in the communication processes could not be realistically presented within a single academic field of learning. In order to ensure an adequate coverage of the communication area, a group of professional people were identified and recruited from disciplines considered to be of the greatest potential value to the project. The main workers were from the fields of psychology, English (creative writing), and speech (speech pathology). Other areas that were represented in the project included Air Force ROTC, anthropology, basic communications, education, remedial reading, and sociology. The representatives of each of these disciplines contributed in a way that we felt assured that the domain of communication was covered adequately for an initial major effort.

At the first meeting of the research team, the principal investigator presented the overall task and possible approaches for analyzing communication abilities. It was apparent that some delimitation of the exceedingly large and complex communication field would be required in order to provide a sound approach to the problem. As indicated earlier, reading, listening, talking, and writing were accepted as sufficiently inclusive areas for the selection and creation of tests, and yet were considered sufficiently circumscribed to permit the relatively independent development of each area. The group realized that other kinds of communication abilities exist but chose to limit their efforts in this initial project to these four broad types, with much more intensive coverage of the expressive than of the receptive activities.

Many kinds of communication skills were listed and categorized. Many hypotheses which aided in the development of tests arose rapidly and in crude form at this early stage. Existing tests and factors were studied and judged for their relevancy, and frequently new test ideas evolved from such studies.

Mimeographed copies of revised outline structures, new hypotheses, and ideas for new tests continually were prepared and distributed to all the research members for their consideration. As individuals and subgroups constructed drafts of new tests, these tests were reviewed thoroughly, with the entire group submitting suggestions for modifications. Most of these tests were tried out on small samples and the results were reported in later research team conferences.



A review of related literature from various disciplines was conducted periodically throughout the study. By means of group meetings the entire research team became quite familiar with the literature pertaining to communication skills and psychological testing methodology. A technical report prepared from selected sources by Smith, and Eckles (1956) on certain literature of small group research related to communication situational testing and on communication requirements of Air Force job specialities was of considerable help in guiding progress through these areas of the research development. In that report, Air Force job specialities were analyzed to determine what communication abilities are required. Here the expertness of three members of the Air Force ROTC staff contributed invaluablely.

The early phases of the project were truly a team effort. It was felt that many problems were anticipated and methods developed in the meetings which might easily have been overlooked by individuals working alone. Ideas grew rapidly during the free exchange which flowed from the spontaneous group interactions. The meetings held in the early stage were very provocative and were probably the most crucial and fruitful part of the entire activity. Ideas arose in almost endless streams and unfortunately only a fraction of these new ideas could possibly have been studied.

The term "communication" will be used hereafter in a very broad sense, and not in a limited sense as it often is in Army Signal Corps communications systems or in some approaches to information theory. Our concept of communication abilities is broad enough to encompass much of what is involved in social intelligence and from strictly an individual and not a group basis, probably accounts for a sizeable portion of human relations phenomena. It is also believed that personality traits condition communicative behavior and are therefore partly measured when testing for communication abilities. It is recognized that many of the communication abilities can also be conceived as intellectual abilities. For example, in Guilford's Structure of Intellect (1964) the expressive abilities would overlap his productive thinking of both the convergent and divergent types.

In retrospect, the research team felt that the subjects were very cooperative in the communication abilities testing and that this quite palatable title for the tests, plus the nature of the tests, proved personally less threatening to the subjects than if they had been given either "intelligence" or "personality" tests. And yet the communication abilities approach can probably measure most of what is being measured in both the intelligence and the personality domains. In addition, people are presumably more willing to admit that they cannot write well or do not like to give a speech, etc., than they are to acknowledge a low score in an

intelligence profile or an extreme score in a personality profile. The subjects may also be quite aware that a low score in a communication ability can ordinarily be improved through training if they are sufficiently motivated to strengthen this weakness.

#### An Analysis of Air Force Job Specialities

In numerous jobs, one of the skills needed for successful performance is some type of communication ability. And many jobs require several different types of communication ability. In fact, in a report concerning job requirements one of the main job factors that was rated was communication skills. The rater was asked to consider "the extent to which the job requires skill in oral and written communication" and "the complexity and variety of information communicated as well as the level of the individuals and agencies involved," (June 1954, p.3).

The Air Force communication requirements were assessed by our staff through a survey of the Warrant Officer and Airman Classification Manual. The list of communication activities compiled from the job descriptions contributed variously to the research, in such matters as the improved orientation of the research group, the development of hypotheses, and the design of predictor and situational tests. A total of 38 career fields, shown in Table 1, covering 415 job descriptions were examined, and among these we distinguished 75 communication activities. Although there is some overlap among some of the activities, important differences and similarities can be identified rather easily.

It was felt that the communication activities appearing most frequently among the Air Force jobs would, to some degree at least, be those most important to the Air Force. However, it is possible that an extremely critical type of communication activity will appear only a few times in the entire series of job descriptions. This possibility was watched carefully, but the situation did not appear to be occurring very often. One such less frequent but important activity is indicated in the descriptive phrase "presents oral briefings," which appeared in only 11 descriptions. Critical activities of this type should be given greater weight than their frequency of occurrence indicated. In other words, both frequency and importance of the communication must be considered in determining the value of communication abilities in the job.

Table 2 shows the communication requirements and the frequency of appearance for each requirement across the job studied. The breadth of our interpretation of communication activities is well illustrated by what is included in this list. The interpretation of the list may be misleading if the reader concludes that those



**Table 1**

**CAREER FIELDS ANALYZED FOR COMMUNICATION REQUIREMENTS**

Administrative Career Field  
Aircraft Accessories Career Field  
Aircraft Accessories Maintenance Career Field  
Aircraft and Engine Maintenance Career Field  
Aircraft Control and Warning Career Field

Aircrew Production Career Field  
Airman Training Devices Career Field  
Air Police Career Field  
Armanent Systems Maintenance Career Field  
Atomic Weapons Career Field

Band Career Field  
Communications Career Field  
Construction Career Field  
Dental Career Field  
Fabric Leather and Rubber Career Field

Finance Accounting and Auditing Career Field  
Fire Fighting Career Field  
Food Service Career Field  
Intelligence Career Field  
Intricate Equipment Maintenance Career Field

Investigation Career Field  
Marine Career Field  
Medical Career Field  
Metal Working Career Field  
Motorized and Miscellaneous Equipment Maintenance  
Career Field

Personnel Career Field  
Photographic Career Field  
Photomapping Career Field  
Pilotless Aircraft Guidance and Control Systems  
Career Field  
Printing Career Field

Production Control Career Field  
Radio Radar Systems Career Field  
Statistical and Machine Accounting Career Field  
Supply Career Field  
Transportation Career Field

**Table 1 (Con't.)**

**Utilities Career Field**  
**Weather Career Field**  
**Wire Maintenance Career Field**

Table 2

FREQUENCY OF COMMUNICATION REQUIREMENTS

<u>Requirements</u>	<u>Frequency</u>
Supervises subordinates. . . . .	384
Assigns work--prepares schedules and assignments . . . . .	328
Conducts on-the-job training . . . . .	317
Evaluates performance, reviews work. . . . .	265
Inspects and evaluates . . . . .	214
Interprets reports . . . . .	213
Maintains records, files . . . . .	200
Instructs. . . . .	193
Orients new personnel. . . . .	188
Establishes production standards, controls, and methods . . . . .	187
Writes and prepares reports. . . . .	171
Plans and organizes activities . . . . .	169
Analyses reports . . . . .	135
Advises, makes recommendations . . . . .	121
Provides for use and control of equipment, space, and time. . . . .	115
Develops and improves work methods and procedures. . . . .	114
Determines personnel and/or equipment requirements . . . . .	114
Coordinates activities . . . . .	111
Prepares and interprets charts, graphs, maps, specifications. . . . .	108
Rates personnel. . . . .	96
Resolves technical problems. . . . .	95
Conducts classes and conferences . . . . .	84
· Informs subordinates . . . . .	84
Discusses inspection findings--interprets. . . . .	83
Resolves personnel problems and situations . . . . .	80
Edits and evaluates reports. . . . .	70
Plans workloads. . . . .	70
Directs activities . . . . .	69
Designs organizational structure charts. . . . .	61
Compiles source material . . . . .	54

Table 2 (Con't.)

<u>Requirements</u>	<u>Frequency</u>
Controls work flow. . . . .	53
Assigns personnel . . . . .	47
Maintains morale. . . . .	41
Serves on committees. . . . .	37
Obtains background information about personnel. . . . .	28
Collects and prepares information . . . . .	28
Demonstrates new equipment, techniques. . . . .	28
Prepares documents and manuscripts. . . . .	25
Receives and copies information by radio or telephone . . . . .	25
Transmits information by radio or telephone . . . . .	23
Prepares, disseminates information. . . . .	22
Cares for patients. . . . .	17
Interrogates, counsels, interviews. . . . .	15
Performs research and development . . . . .	11
Presents oral briefings . . . . .	11
Prepares abstracts, extracts, and summaries . . . . .	10
Computes statistics . . . . .	10
Prints and duplicates . . . . .	10
Conducts ceremonies . . . . .	7
Makes sketches, templates . . . . .	7
Analyzes and verifies reports . . . . .	7
Enforces law, guards. . . . .	6
Administers tests . . . . .	5
Lectures. . . . .	5
Maintains discipline. . . . .	5
Serves as receptionist. . . . .	4
Leads formations of troops in drills and parades. . . . .	4
Decodes and deciphers . . . . .	4
Dispatches aircraft, vehicles . . . . .	4
Implements procedures, policies . . . . .	3
Checks safety conditions. . . . .	3
Develops identification characteristics of radio nets . . . . .	3
Prepares or processes radio traffic . . . . .	2
Translates languages, oral and written. . . . .	2
Interprets photos . . . . .	2

Table 2 (Con't.)

<u>Requirements</u>	<u>Frequency</u>
Distributes and handles mail. . . . .	2
Selects personnel . . . . .	2
Re-records, mixes sounds. . . . .	2
Cultivates interest of subordinates . . . . .	1
Plans filing and library systems. . . . .	1
Transcribes information on status boards. . . . .	1
Analyzes textual features of radio messages . . . . .	1
Schedules operations of radio networks. . . . .	1
Prepares narrative of action photographed . . . . .	1
Operates alarm system . . . . .	1

items checked only a few times are moderate or low in frequency rating. He must interpret them in relation to other highly related items and realize that the more true frequency picture would be obtained by combining the separate frequencies for all related activities. For example, "controls work flow" is more important than it appears to be, because it can justifiably be combined with the related activities "develops and improves work methods and procedures," and "plans workloads," to yield a composite frequency of 237. There was merit in retaining this list in its original form for various reference uses.

For the purposes of situational test construction, one of the research staff grouped all the activities and made generalizations regarding the type of performance required in each. Although this grouping is somewhat arbitrary, it was useful as an aid in developing criterion tests in typical communication situations and is presented later when these situational criteria are described.

In the following chapter some of our thinking at the beginning of the entire project is presented in the form of hypotheses and postulated factors. Next the entire set of the predictor tests that were used one or more times in the project are described and categorized according to whether they were existing and new tests and according to the main channel of communication required in taking them. In the course of the project three different batteries of scores were used; they are called Battery A, Battery B, and Battery C. Battery A included only aptitude test scores which are described in the fourth chapter. Battery B containing some of these aptitude scores and many personality and other self-report scores is described in the next chapter along with analyses accomplished on Battery B scores. All of the factors found in both Battery A and B are outlined and discussed in Chapter 6 and the details of the factor analyses of Battery A scores and of Battery B scores are contained in the appendix. The next seven chapters describe the 57 predictor scores and the 27 situational criterion scores in Battery C, all the different types of analyses performed on the Battery C scores, and discussion of these results. The last three chapters review all of the studies and draw conclusions and implications from the entire project. Following a list of references, the Appendix also contains some of the lengthy and detailed tables of the report, and a factor analysis of only the 27 criterion scores in Battery C.



## CHAPTER II

### HYPOTHESES AND POSTULATED FACTORS

Combining their varied resources of information and understanding, the research group attempted to structure the area of communication skills and abilities. For each of the major areas, of reading, listening, writing, and talking, a multitude of hypotheses were expressed, many of which at this stage of knowledge could not readily be measured and investigated. However, a great many were either related to tests that were already in existence or were measurable by proposed new tests.

A major observation of the research group during this formulation of hypotheses was that the domain of communication is extremely complex and has barely been opened up in a few areas by past studies. One hundred and nine hypotheses regarding communication abilities were stated in the early stages of the project, and many more could be readily evolved in draft form, with little effort. It seems that historically the typical approach to communication abilities has been much like that in the field of intelligence measurement, with a focus mainly on only "overall ability." From the hypotheses evolved in this research it seemed that the overall ability to communicate is at least as complex as intelligence (or even the total intellect) and can be analyzed into as many if not more factors, some of which would be common to both intelligence and all-round communication ability.

In the process of selecting the hypotheses thought to be currently most suitable and available for prediction research, approximately 30 gradually evolved and were formalized. Those considered for investigation, to at least some degree in this study, are each given a main title and are listed on the following pages, whereas the others were temporarily shelved for future work. This collection should in no way be interpreted as a final structuring of the field of communication abilities. Instead, it merely provided an initial tentative framework for moving ahead to explore portions of the total field, with more attention at this time being given to expressional abilities than to other communication areas. Each hypothesis has been sorted into one of three classifications, according to whether it pertains primarily to existing measures (all of which were all intellectual in nature except the measures of empathy and fear), to new intellectual measures of communication abilities, or to new personality measures underlying communication activities. More will be said about the importance of these hypotheses later when we deal with factors in the hypotheses.

A. Hypotheses pertaining to existing measures:

1. Associational Fluency: High associational fluency scores will be related to successful performance in activities such as instructing, conducting conferences, conducting interviews, advising on technical problems, writing reports, presenting oral briefings, etc.

2. Empathy: Persons having more empathy, i.e., intuitive perception of the physical and psychological states of an audience, will be more efficient communicators, especially in public speaking and other talking activities.

3. Expressional Fluency: The facility with which one expresses an idea in alternate ways will in some degree determine his success as an instructor and in other oral communications.

4. Fear: Fears usually reduce the quality and alter the quantity of communications. Hence, scores on anxiety or fear scales will be inversely related to one's effectiveness in expression and reception.

5. Flexibility: Flexibility in communication, the ability to adjust words, sentences, and whole communications for maximum reception, will be found more in good communicators than in poor ones.

6. Fluency: Fluency in communication, the ability to talk, write, and read without hesitation, and to listen without lapses of attention, is an attribute of the good communicator.

7. Ideational Fluency: Persons having very high scores (or very low scores) on ideational fluency tests will be less effective in transmitting information in an instructional situation than those in the middle range, when verbal ability, as measured by a vocabulary or verbal analogies test of appropriate difficulty, is held constant.

8. Originality: Use of original words, ideas, or expressive forms in writing and talking tends to arouse audience interest, at least momentarily.

9. Silent Reading: Ability to read silently (to oneself) may differ significantly from ability to read aloud to others.

10. Vocabulary Type: Scores on a reading vocabulary test will correlate more highly with the ability to communicate effectively in writing than in speaking; likewise, scores on a speaking

vocabulary test will correlate more highly with the ability to communicate effectively in talking than in writing.

11. Vocabulary Size: Since persons with extensive vocabularies have more terms to express the shades of their meaning, they will express their communications more exactly, both orally and in writing, than persons with limited vocabularies.

12. Word Fluency: Word fluency scores are less predictive of communication skills in military situations than other fluency scores or quality of expression scores.

B. Hypotheses involving new intellectual measures:

1. Abstracting: Persons able to abstract essential ideas from lengthy exposition will tend to surpass those who are less able abstracters in their ability to read, listen, talk, and write.

2. Correcting-a-Passage: The ability to recognize and remedy an incorrectly written passage is one mark of an effective writer and reader.

3. Critical-Mindedness: The communication effectiveness of those with an optimum degree of critical-mindedness, the self-monitoring of ideas and expressions, will tend to excel that of persons with either a low or an extremely high degree of critical-mindedness.

4. Interest-to-the Audience: Communicators who can arouse interest in the receiver will evoke a higher degree of understanding than those who cannot.

5. Listening: More efficient listeners will tend to be above average in reading, writing, and talking activities.

6. Missing Parts: Persons who have great facility in supplying the part missing from a communicative structure have perceptiveness of the degree of completeness and balance of a communication and will be better communicators than those with lesser amounts of this ability. (They may also be above average in intuitive ability.)

7. Organizing: Tests of the ability to organize elaborate verbal material will predict skill in military situations requiring the summarization of regulations and procedures and the drafting of simple practical plans which are in accordance with those procedures.

8. Quality of Expression: Scores of quality of expression will predict effectiveness of communication better than scores of quantity of expression, such as fluency scores.

9. Reading Aloud: Ability to read aloud depends on articulation, enunciation, pronunciation, and voice quality, all of which are intrinsic in verbal communication. It is therefore hypothesized that persons with high ability to read aloud will be better all-round communicators than persons deficient in this ability.

10. Reduction: Persons able to make wordy expressions into concise statements tend to surpass in both writing and talking than those less able to do so.

11. Skimming: Those efficient in typical reading comprehension tasks are more likely to be good skimmers than are poor readers.

12. Subtleness: The superior communicator will tend to surpass the poor one in ability to produce and to receive subtle communications.

13. TWX: The ability required in telegram writing to abstract and compress the essentials of a communication into a few carefully chosen key words in abbreviated sentence form will be found significantly more in good communicators than in poor ones.

C. Hypotheses involving new personality measures:

1. Aspiration: Persons aspiring to a high level of communication are more likely to be effective writers and speakers than those aspiring to only a low level.

2. Experience: Persons having a rich background of experiences in communication tend to be more effective in communication than those with a limited background.

3. Extemporaneousness: The ability to speak extemporaneously is a good single predictor of other talking abilities.

4. Interest-in-the-Communication: Persons with a high interest in verbal materials will usually be better communicators than those with a low interest.

5. Self-Reports: Self-reports (self-ratings), if honestly filled out, should give some evidence of a person's communicative abilities and should correlate at least moderately with actual performance. And persons will tend to rate themselves more honestly

on communicative abilities than on intelligence or on usual personality characteristics.

6. Stress: Communicators who are good under normal conditions should be able to concentrate and continue communicating better when placed under stress than will poor communicators.

#### Factors Postulated to be Functioning in the Hypotheses

The postulation of factors and the statements of hypotheses now become extremely crucial to this analytical exploratory study. Here the rationale will be presented in detail in order to show the importance of these steps.

A major problem, and this is a problem in much psychological research, is the criterion one. For the moment we must assume that sound criteria of communication performances are obtainable.

In the preceding section we have formulated hypotheses about the variables related to performance in communication and these hypotheses are important to guide our selection of tests, among other things. It should be remembered, however, that not all hypotheses formulated are included here, so that all possible variables postulated to be present in communication performances are not presented in this exploratory study.

To further simplify the selection and construction of tests, factors functioning in the hypotheses of performance were postulated. In other words, the multitude of hypotheses entailed many variables, which might be reduced to a smaller number by searching for the underlying factors involved. Both well established factors and new factors not heretofore clearly identified and measured may be functioning in the communication chosen for study. Tests selected or constructed for this project whose factor content has only been determined subjectively will need to be examined empirically to gain greater insight into how they function in terms of our hypothesized relationships.

All test scores in the battery were chosen with the expectation that they would be related significantly to live communication performances in a predictable fashion. That is, if hypotheses about factors in a particular performance are made and if the factors involved in those performances have been postulated correctly, then tests of those factors should correlate significantly with those performances. In the present stage of knowledge, however, we are unable to formulate hypotheses with such insight that precise prediction is possible, i. e., our expectations could be incorrect because of many unforeseen phenomena. Our insights are not yet



adequate to enable us to prescribe with accuracy in advance. Thus, all tests should be factor analyzed even if predicted relationships do not hold up. The area of communication abilities may prove to be so complex that hypotheses and predictions at this stage will not cover all aspects of the area investigated. If the area turns out to be highly complex, one may hope that a greater degree of specificity will become possible as a result of these explorations.

Since several factors are probably functioning in the selected set of hypotheses, the staff decided to try to identify these factors subjectively as either already established factors or as new factors that might be expected to appear in factor analyses of the new predictor tests.

For all new factors expected to appear in the analytical studies, a priori names and descriptions were attempted in order to clarify the research team's thinking. The staff did not make any strong attempt to reach unanimous agreement either in this list of expected factors or in their descriptions. These expected factors merely provided some early inroads into the total area of communication abilities. The procedure of the staff may serve to illustrate our initial broad and varied subjective analysis of the communication research area.

Some of these factors made their initial appearance when individual members of the research team completed a "subjective factor analysis" of the first assembled set of predictor tests. That is, the nature of each test was subjectively analyzed in an attempt to identify any landmark factors and any new factors that they supposed would be functioning as subjects performed on the tests. New factors were listed when the existing set of established factors seemed inadequate to account for most of the differences between individuals in the test scores. This subjective factor analysis required the researchers to become realistically acquainted with the nature of the test performances and scores, thereby giving the non-psychologists on the team a preview of what the results might be like after the empirical data to be obtained later had been factor analyzed by traditional techniques.

The descriptions of previously identified factors were taken from the appropriate sources in the literature, such as French's aptitude and achievement monograph (1951), French's manual for the kit of selected tests for reference aptitude and achievement factors (1954), Guilford's early studies (1957), etc. A total of 41 expected factors of communication ability were listed, including 10 landmark factors and 31 a priori factors expected to appear in the factor studies of all the predictor tests. In Table 3 these 41 factors are listed and classified into the somewhat arbitrary



Table 3

FACTORS JUDGED TO BE FUNCTIONING IN THE HYPOTHESES

<u>Main Category</u>	<u>Landmark Factor</u>	<u>Expected Factor</u>
Reading	Verbal Classification (VC)	Reading Ability (not elsewhere classified)
	Verbal Knowledge (V)	Sensing Patterns Skimming Ability
Listening		Listening Ability (not elsewhere classified) Speech Sound Dis- crimination Ability
Writing	Associational Fluency (AF)	Celerity
	Expressional Fluency (EF)	Compactness of Ex- pression
	Ideational Fluency (IF)	Critical-Mindedness
	Naming	Distortion Tendency
	Originality (O)	Extracting Ability
	Sensitivity to Problems (SP)	Inventiveness
	Spontaneous Flexibility (SX)	Organizing Ability
	Word Fluency (W)	Restructuring Abil- ity
		Revision Ability
		Richness of Express- ion
		Sensitivity to Im- portant Ideas
		Writing (not else- where classified)
Self-Report		Manifest Anxiety
		Communication Rat- ings by Self
		Experience in Comm- unications
		Interest in Commu- nication Activi- ties
		Talking Ability (not elsewhere classified)

Table 3 (Con't.)

<u>Main Category</u>	<u>Landmark Factor</u>	<u>Expected Factor</u>
Personality		Achievement Motivation Acquisitiveness Affiliation Motivation Communication Ratings by Peers Communication Ratings by Superiors Drive to Improve Empathy Personality (not else- where classified) Status Need

categories of reading, listening, writing, self-report, and other personality factors. No predictor tests were direct measures of talking abilities, which perhaps were measured to some degree and only indirectly by ratings in our second battery (Battery B) and by certain test scores in our first battery (Battery A).

Although some overlap was expected among the factors listed in Table 3, it was felt that a fairly large number of factors would be found because of the anticipated complex nature of the domain of communication abilities. One refinement in the above list that could have been but was not attempted would have been to have the research team engage in a series of intensive sessions after completing the subjective factor analysis to discuss the differences in judgment that arose. Then after all new factors which seemed to be functioning had been thoroughly discussed, the subjective factor analysis could have been repeated to see to what degree greater agreement in judgments about factors would have occurred.

This early thinking about potential factors was excellent preparation for moving ahead to the next stage of selecting and constructing the predictor tests to be used in the series of studies.

## CHAPTER III

### THE PREDICTOR TESTS

Following our common practice in our research projects, we decided to use both existing tests and tests especially designed and constructed for our particular purposes. As is our custom, we placed our greatest effort primarily, though not entirely, on new "tailor-made" tests. But existing tests are used in order to provide landmarks for psychological areas already measured and to yield whatever validity possible from these already measured areas. Consequently, a number of existing tests--those already constructed, reported, and analyzed in other studies--were selected for use as landmark tests to represent well-determined factors from past studies, because their content seemed related to one or more of the selected hypotheses. In many cases an existing test was "adopted" for use with no changes. However, in some cases changes in the test were made either in the number of items or in the time limits involved, and the test was therefore "adapted" for use. These existing tests were cleared for use by obtaining permission of the authors or copyright holders.

From the existing portfolio, 47 tests were considered, but only 23 were finally used in the subsequent testing. These were used to measure 10 previous identified factors which met the requirements of being fairly stable "aptitude landmark factors," plus some expected personality factors. However, the relevance of the landmark factors to many of the hypotheses presented earlier had not previously been determined empirically, so these existing tests were included in order to provide means of investigating the relationship between the selected landmark factors and skills in typical communication situations. These landmark tests were also included to determine whether the new predictor tests measured new factors or were merely alternate measures of these previously identified factors.

Table 4 lists (1) the 23 existing tests adopted or adapted for use, yielding 40 scores, as indicated in parentheses, (2) the previously found or expected factor content of the most typically used score, and (3) the authors. Each test is classified within one of the categories of reading, writing, or other personality tests.

As indicated earlier, new tests relevant to the hypotheses were developed that hopefully measured factor variables which were either unique in this study or not adequately measured by existing tests. All new tests retained for use were thought to be predictors of particular communication skills.

Table 4  
EXISTING TESTS ADOPTED AND ADAPTED FOR USE

<u>Main Category</u>	<u>Test Name</u>	<u>Main Factor Content</u>	<u>Author</u>
Reading (4)	Verbal Classification (1)	Verbal Classification	Guilford
	Completion (1)	Verbal Knowledge	Thurstone
	Vocabulary (1)	Verbal Knowledge	Carroll
Writing (30)	Word Knowledge (1)	Verbal Knowledge	Air Force
	Sentence Gestalt (2)	Association Fluency	Guilford
	Two Way Associations (1)	Associational Fluency	Guilford
	Word Association (5)	Associated Fluency	Guilford
	Letter Star I (1)	Expressional Fluency	Carroll
	Similes I (3)	Expressional Fluency	Carroll, C. Taylor
	Sentence Fluency (2)	Expressional Fluency	C. Taylor
	Theme (1)	Ideational Fluency	Cattell
	Topics (2)	Ideational Fluency	Cattell
	Naming Names (1)	Naming	Carroll (from oral form)
	Naming States (1)	Naming	Carroll (from oral form)
	Consequences (2)	Originality	Guilford
	Plot Titles (2)	Originality	Guilford
	Social Institutions (3)	Sensitivity to Problems	Guilford
	Brick Uses (2)	Spontaneous Flexibility	Guilford
First and Last Letters (1)	Word Fluency	Thurstone	
Suffixes (1)	Word Fluency	Thurstone	
Personality (6)	A Test of Insight (3)	Achiev., Affil., Status	French
	Empathy Test (1)	Empathy	Kerr
	PE Scale (2)	Manifest Anxiety, Lie	Taylor Key of MMPI

Before a new predictor test could justifiably be used, it had to meet several criteria. Its judged factor content had to be relevant to a hypothesis already developed or to a new, worthwhile hypothesis growing out of a test idea. It was decided that the time involved for each test should be relatively short so that many experimental predictors could be administered in a limited time. The test had to be susceptible of group administration to large samples. Proctoring requirements could not be too complex, since limited staff would be available for the administration. The tests had to have high interest for the subjects as well as an element of face validity. This last requirement seemed necessary in order to obtain the best cooperation from the subjects during the lengthy periods of testing that were anticipated.

The 29 new predictor tests (together with their number of scores written in parentheses--a total of 76 scores) that were ultimately constructed for use are listed below in Table 5 according to whether they are primarily reading, listening, writing, self-report, or other personality tests.

Table 5

NEW PREDICTOR TESTS DEVELOPED FOR USE

Reading (3)

Skimming Exercise (3)

Writing (39)

Abstracting (3)  
 Compounding Words I (2)  
 Compounding Words II (5)  
 Letter Star II (2)  
 Letter Star III (2)  
 Outlining I (1)  
 Outlining III (1)  
 Revision I (2)  
 Revision II (3)  
 Sentence Building (2)  
 Similes II (2)  
 Similes III (3)  
 Telegram Writing I (3)  
 Telegram Writing II (3)  
 Telegram Writing III (3)  
 Word Story (2)

Listening (2)

Auditory Retention (1)  
 Speech Sound Discrimination (1)

Self-Report (26)

Adjective Check List (2)  
 All-Round Ability (4)  
 Biographical Information Blank (4)  
 Interest Scales (4)  
 Phrase Check List (2)  
 Satisfactory Ability Scales (8)  
 Speech Attitude Scale (1)  
 Writing Attitude Scale (1)

Personality (6)

Qualities of a Superior Speaker (1)  
 Sociometric Questionnaire (peer ratings) (5)



The 23 existing tests plus 27 new tests totaled to 50 predictor tests that were selected or constructed for Batteries A and B. We followed a practice of building multiple scores per tests wherever it was reasonable to do so. Consequently, these tests yielded 105 different scores, an average of over 2 scores per test. Two revised tests, Outlining III (1 score) and Telegram Writing III (3 scores), were produced for use only in Battery C and seven other new scores were derived from Battery C predictors, so that a grand total of 52 tests with 116 scores was used one or more times across the three batteries.

The research team was extremely fruitful in generating new ideas for tests. In fact, so many predictor tests were constructed that it became necessary to assemble the two large batteries, Battery A and Battery B, with some tests as common links in place of the smaller single battery originally planned for the initial factor study phase of the project. Each battery was subsequently administered to a sample of airmen, was scored, and was factor analyzed to reduce overlap and to determine which set of tests would be retained as the predictors in the final battery (Battery C) in the validation experiment.

Table 41 in Appendix III lists alphabetically all predictor tests used in the entire project. This table gives the name of the test, the number of scores for the test (in parentheses), the time limit where applicable (including time limits for each subtest of a test), a description of the task involved, and a brief account of the scoring techniques. Since multiple scores were used on the majority of the tests, the different scores per test are distinguished in the table by the use of a "small-letter" outline. The table also gives the "test score number" for each predictor score whenever it appeared in any of the three batteries. Since the "test score number" for any given test score differs from one battery to another, it is necessary to refer to this table in order to locate the correct number for a particular score in Batteries A, B, or C.

As can be seen from Tables 4 and 5, 7 reading scores, 2 listening scores, 69 writing scores, 26 self report scores, and 12 other personality scores comprised the total set of 116 predictor scores used one or more times in the three Batteries A, B, and C.

## CHAPTER IV

### THE BATTERY A STUDY

Battery content. The hypotheses related to basic ability requirements in the communication process were most important in determining the composition of Battery A. This battery included ability tests of two general types: (1) those existing tests which measured previously well identified landmark factors, and (2) new aptitude or ability tests designed specifically for this study as possible measures of important communication factors deduced from the hypotheses.

The 65 scores in Battery A were obtained from 35 tests, 19 of which were tests adopted or adapted from former aptitude factor studies, and 16 of which were newly designed tests. Table 42 in Appendix III includes the names of the tests and test scores, their sequence number, their factor content in the case of landmark tests, their means and standard deviations, and their communalities ( $h^2$ ) if they were retained in the factor study. The communalities can be viewed as under-estimates of reliability coefficients. These 35 tests were a subgroup of all predictor tests described in the previous chapter.

Table 6 below presents an outline of the 35 tests in terms of the categories of reading, listening, and writing. The number of scores for each test and for each category is listed in parentheses in each case. This table clearly shows that Battery A heavily emphasizes written expression in its coverage

Table 6

#### OUTLINE OF THE 65 PREDICTOR SCORES IN BATTERY A

<u>Reading</u> (5)	Compounding Words I (2)
Completion (1)	Compounding Words II (5)
Skimming Exercise (2)	Consequences (2)
Verbal Classification (1)	First and Last Letters (1)
Vocabulary (1)	Letter Star I (1)
	Letter Star II (2)
<u>Listening</u> (2)	Letter Star III (2)
Auditory Retention (1)	Naming Names (1)
Speech Sound Discrimination (1)	Naming States (1)
	Outlining I (1)
<u>Writing</u> (58)	Plot Titles (2)
Abstracting (3)	Revision I (2)
Brick Uses (2)	Revision II (3)

Table 6 (Con't.)

Sentence Building (2)	Telegram Writing I (3)
Sentence Fluency (2)	Telegram Writing II (3)
Sentence Gestalt (2)	Theme (1)
Similes I (1)	Topics (2)
Similes II (2)	Two Way Associations (1)
Similes III (3)	Word Association (3)
Suffixes (1)	Word Story (2)

Since many of the preliminary hypotheses implied that good communication was partly influenced by a person's ability to react flexibly to different situations and requirements, several tests were designed to measure various kinds of flexibility. For instance, the similes test idea was adapted to measure the ability to produce similes under three different conditions or sets. The conventional similes test (Similes I) was one which asked the subject to write a single appropriate ending for each beginning phrase of a simile in a long list. Similes II requested the subjects to write a maximum of three different completions of similes for each of several stimulus phrases, and Similes III required the subjects to write as many different similes as possible in response to one beginning stimulus phrase in each of its two subtests.

The Letter Star series--I, II, and III--was also of this type. These three exercises were designed to measure this "fan effect" in the same way as the similes series: i.e., in one case there is one response per stimulus phrase, in the second there are three responses per stimulus phrase, and in the third the respondent makes as many responses as he can to one given stimulus phrase.

Another series of exercises, Revision I and Revision II, were graded for different levels of difficulty, another kind of flexibility. Revision I was designed to measure simple editing ability, merely involving the crossing out of unnecessary words, while Revision II required a more complex performance involving rewriting phrases and sentences by reorganizing, restating, deleting, and changing words. Compounding Words I and Compounding Words II also form a series representing two levels of difficulty in word production, one in which relatively easy compound words are formed and the other more difficult one in which new compound words with a given meaning are created.

The two listening tests presumably sample two different types of listening ability. The Speech Sound Discrimination Exercise measures one's ability to aurally perceive differences in sounds of words, while the Auditory Retention test requires one to listen,

retain, and recall the content of a recorded lecture.

Telegram I and Telegram II measure one's ability to report a complex situation in a complete but extremely brief manner. Telegram I restricted the response to a lesser degree than did Telegram II, since it allowed the subject to write the telegram with no absolute restriction on the number of words. The only limiting factor here was the "expense of additional words." The Telegram II exercise in this series placed an absolute limit of 10 words on the writing. This difference in difficulty was relevant to the hypothesis that a good communicator is one who can not only express himself in a clear, concise manner but can do so under different circumstances.

The other tests in this battery are straightforward in nature and are not graded in difficulty as are those mentioned above, nor do they appear in a varying series of a given type.

Sample and test administration. Battery A was administered to 306 airmen (with a final sample of 274) at Lackland Air Force Base, San Antonio, Texas with a test administrator from the University of Utah in charge of the experimental testing. A maximum of 65 men were tested at one time. The groups were kept about the same size in order to standardize the conditions for the entire sample. A description of the sample with regard to age and education is contained in Table 7.

Table 7

BACKGROUND OF BATTERY A SAMPLE

<u>Education</u>	<u>Number</u>	<u>% of Sample</u>
Grade School Incomplete	11	4
Grade School Completed	179	58
High School Completed	100	33
College: 1 year completed	12	4
2 years completed	3	1
3 years completed	0	0
4 years completed	1	0
over 4 years completed	<u>0</u>	0
Total number tested	306	
Number omitted because 1 or more of their test papers were illegible	<u>32</u>	
Total number in final sample	274	

Tentative time limits were established prior to this final testing, but in many instances these proved to be inadequate. The proctors and test administrator watched the performance closely on the first subgroup and the testing was stopped when it was felt that the sample had been allowed enough time to perform adequately. In this way the time limits were standardized for use on all later subgroups. From previous administrations on other samples, tentative time limit estimates had been made, but this final setting of time limits was accomplished to insure optimum performance from the group of airmen. Accurate records were kept, and whenever the tests were administered again, the time limits established in this initial testing were adhered to meticulously. Since many of the tests appearing in Battery A were also in Batteries B and C, the necessity for this precaution is obvious.

Inasmuch as the experiences of taking many of the tests were entirely new for the subjects, clear and precise instructions were not only printed on all tests but were read aloud by the test administrator over a loudspeaker system. When difficulties were encountered, the proctors assisted efficiently in clarifying the questions.

Since most of the tests required written answers, it was essential for every paper to be legible. If one or more papers in an airman's set of tests were not legible, his entire set of papers was withdrawn from the sample. As a consequence, 32 sets were eliminated so that the correlational and factorial studies were accomplished on the sample of 274 airmen.

The reliability of new tests in Battery A. The "existing" tests used were considered to have adequate reliability data from previous studies reported by their authors. Reliability coefficients were computed for those "new" variables in Battery A which lent themselves to such analysis without retesting the samples. Communalities from factor analyses are also available as lower bound estimates of reliabilities for all tests retained in any of the three factor studies. In tests where multiple items appeared, a correlation coefficient was computed between scores across the odd versus the even items. In those involving only a single exercise without separate items, a coefficient was computed between the first half of the performance and the second half, as determined by a line marked by the subject when half of the time for the total performance had elapsed. Other exercises were composed of two parallel parts, usually appearing on separate pages and timed separately; in such cases the first part score was correlated with the second part score to arrive at an estimate of reliability.



These reliability statistics appear in Table 8. They had all been corrected upwards by the Spearman-Brown prophecy formula from split half length to estimate the reliability for full length.

The coefficients so derived vary from .30 to .87. The range of corrected reliabilities for all but four of these new scores is between .57 and .87. When one considers the complexity of the tasks, the complex subjective scoring techniques frequently used and the comparative "shortness" of most of the tests, it is encouraging to find many of the reliabilities toward the higher end of this range. The extremely low coefficients were derived from two parts of one type of test or from different scorings of the same tests. It is probable that the two parts of the two scores so computed were different enough in content to reduce the correlations, as in the case of Compounding Words I, where two different words were used as stimulus words, and in Telegram I and II, which were not strictly parallel tasks. The method of obtaining two subscores on both Revision I and II by having subjects mark when half the time had elapsed may not have been very appropriate; in these Revision tests there were many points per item, but not many items, so it was difficult to mark accurately one's exact point of progress at half time. Most of the other scores more nearly met the assumptions of homogeneity requisite to the split-half formula for reliability. These reliabilities were thought to be acceptable for this early, exploratory state of research on communication abilities, where short tests were used to permit time for many different tests in the battery. In practice one could readily lengthen almost all of these tests, resulting usually in an increase in reliability to a desired level.

Statistical analysis. Fortunately for the factor analyses that were anticipated, the SWAC at the Numerical Analysis Section, University of California, Los Angeles, was made available to us. The time necessary to develop the computer program for the study made it impossible to completely analyze Batteries A and B in time for the selection of the final predictors for Battery C. Therefore, the selection of the final predictors in Battery C, as described in a later section, was dependent upon an analysis of only the intercorrelation matrices of Batteries A and B.

Sixty-five scores were extracted from the performances in the 35 tests in Battery A, since several of the tests were suitable for multiple scoring. The types of scores were complex, but can be regarded primarily as either some type of "quantity" score, such as sheer numbers of acceptable responses, or some type of "quality" score, such as the degree of pertinence, abstractness, uniqueness, or originality. Admittedly, the quality scores were more difficult

Table 8

## RELIABILITIES FOR NEW TESTS AND SOME EXISTING TESTS APPEARING IN BATTERY A\*

<u>Test</u>	<u>Scores Used</u>	<u>Full Length Corrected Reliability</u>
Auditory Retention	Lecture I vs. Lecture II	.58
Compounding Words I	1st Exercise vs. 2nd Exercise	.43
Letter Star I	1st Half vs. 2nd Half (time line)	.68
Letter Star II	1st Half total responses vs. 2nd Half total responses	.77
Letter Star III	1st Exercise vs. 2nd Exercise	.72
Naming	1st Exercise (names) vs. 2nd Exercise (status)	.67
Revision I	1st Half vs. 2nd Half (time line, word score)	.57
Revision II	1st Half vs. 2nd Half (time line, idea score)	.33
Sentence Building	1st Exercise vs. 2nd Exercise	.63
Sentence Fluency	1st Half vs. 2nd Half (time line)	.74
Sentence Gestalt	1st Exercise vs. 2nd Exercise	.82
Similes I	1st Column vs. 2nd Column	.74
Similes II	1st Half total vs. 2nd Half total	.84
Similes III	1st Column vs. 2nd Column	.68
Skimming (Items)	Odd vs. Even Items	.87
Skimming (Items vs. Page)	Item vs. Page	.82
Speech Sound Discrim.	Odd vs. Even Items	.71
Telegram (Idea)	1st Exercise vs. 2nd Exercise	.44
Telegram (Word)	1st Exercise vs. 2nd Exercise	.30
Theme	1st Half vs. 2nd Half (time line)	.77
Topics Quality	1st Column vs. 2nd Column	.70
Word Story	1st Exercise vs. 2nd Exercise	.82

\*The reliabilities were computed on an N of 306 before any airmen were eliminated from the sample. In three cases above the same correlations based on the sample of 274 cases were computed in the intercorrelation matrix and were found to be slightly lower. In these three cases the lower correlations are reported above.

to obtain that the quantity scores and required explicit, complex scoring instruction.

The data were intercorrelated by machine methods. The correlations are reported to two digits and with decimals omitted in Table 43 which appears in Appendix III. The correlations were generally low or of modest size, a fact indicating the complexity of the communication ability area under investigation. Nonetheless, over two-thirds of the correlations were significantly greater than zero. Table 9 shows the frequency of the positive and negative correlations of different magnitude found in the Battery A correlation matrix, with a correlation of .16 being significant at the .01 level.

The means and standard deviations computed for the Battery A variables are listed in the previously mentioned Table 43. These normative data are useful when one wishes to compare performances of the samples on tests common to Batteries A, B, and C, or for the other groups outside this study.

Because of computer limitations, a maximum of only 64 variables in a battery could be factor analyzed. This made it necessary to eliminate at least one variable from the set of 65 prior to factoring. To reduce experimental dependence, sets of scores on the same test that were essentially the same measures of the same behavior, as indicated by excessively high intercorrelations, were located by studying the correlation matrix, and in each case all but one of such sets of scores were eliminated. This refinement decreased the possibility of obtaining spurious factor extractions due to excessive overlapping of experimentally dependent variables.

On this basis, 14 scores were eliminated from the intercorrelation matrix prior to factoring the remaining 51 scores. The deleted test scores are indicated by enclosing their identifying numbers in parentheses in the intercorrelation matrix shown in Table 43 in Appendix III. Fourteen factors were extracted and retained for rotation. The last three rotated factors were not interpreted because at least one and possibly all three were residual factors which is ample evidence that sufficient factors were extracted.

Interpretation and discussion of the Battery A factors. The tests having scores with significant loadings on rotated factors were assembled in a convenient form for study and interpretation. The task proved to be difficult since some of the factor results were unorthodox in view of previous studies involving the landmark

Table 9

FREQUENCY DISTRIBUTION OF CORRELATIONS AMONG BATTERY A SCORES

<u>Magnitude of r's</u>	<u>Frequency of Positive r's</u>	<u>Frequency of Negative r's</u>
95-99	2	0
90-94	5	0
85-89	4	0
80-84	2	0
75-79	1	0
70-74	6	0
65-69	1	0
60-64	5	0
55-59	7	0
50-54	19	0
45-49	47	1
40-44	107	0
35-39	157	2
30-34	221	7
25-29	272	7
20-24	263	10
15-19	264	13
10-14	238	15
05-09	216	20
00-04	<u>123</u>	<u>45</u>
TOTAL	1960	120
GRAND TOTAL of negative and positive correlations		2080

tests. The two vocabulary landmark tests of Verbal Knowledge,<sup>1</sup> for instance, had significant loadings from .30 to .50 on three factors (Verbal Knowledge, Associational Fluency, and Listening Comprehension) instead of the usual higher loadings on only one factor. This complexity of vocabulary tests may help explain why they have proved in the past to be comparatively good predictive devices. This "breaking up" of the conventional Verbal Knowledge factor and a similar analysis of Ideational Fluency into multiple factors of Idea Listing Facility, Naming Facility, and Ideational Fluency might be indicative of complexity of these measures and the complexity of the entire domain of communication abilities.

Some of the other factors were also quite different than expected from an a priori view of the task. Associational Fluency and Word Fluency tests loaded high on two or more of the obtained factors, and some of the obtained factors contained landmark tests for two or more of these traditional factors. More clarification on the final solution might have resulted if more than two landmark tests had been used in each case for the traditional factors. These results need not be considered too unusual however, since the studies preceding this research were not as complex and comprehensive in varieties of written expression as this one, nor were many of them devoted to such a wide sampling of the entire domain of communication. The more intensive exploration of written expression plus the otherwise broad goal of the study might well be responsible for discovery of the complex nature of these tests.

The eleven interpreted factors, which included seven landmark factors, were given factor titles. The other three rotated factors did not have enough tests loading positively to be interpreted or in two cases to be considered other than residual factors. The details for the factorial results on Battery A are presented in Appendix I. Each of the 11 interpreted factors were given the names below (plus the capital letter in parentheses) for identification purposes. All the tests with the highest loadings are listed in Appendix I and the psychological basis for naming each factor is also presented therein. The first seven asterisked factors listed below are landmark factors and the other four are new factors.

- \*Expressional Fluency (A)
- \*Associational Fluency (B)
- \*Verbal Knowledge (D)
- \*Ideational Fluency (F)
- \*Spontaneous Flexibility (H)
- \*Naming Facility (J)
- \*Word Fluency (K)

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<sup>1</sup>Verbal Knowledge and Verbal Comprehension are used herein as interchangeable titles for the same factor.



Listening Comprehension (C)  
Resistance to Idea Reduction (E)  
Idea Listing Facility (G)  
Broadly Diffused Attention (I)

Listening Comprehension is a new factor found in a new channel of communication not particularly explored before by factor analysis techniques. Idea Listing Facility and Naming Facility are fluency factors that split off clearly for the first time from Associational Fluency, Ideational Fluency, and Word Fluency in this study. Their bases of separation are almost clear from their titles. The quantity and richness of the "pool of associations" is measured by Associational Fluency. Ideational Fluency entails production of a quantity of ideas usually in meaningful discourse, whereas Idea Listing Facility is more of a production of single word or short phrase lists of ideas. Naming Facility calls for a rapid production of a quantity of names from a large potential pool of appropriate names, such as names of states or names of people. Word Fluency involves production of words according to their structural features (such as number of letters or with a given suffix or prefix) independent of their meanings.

Resistance to Idea Reduction and Broadly Diffused Attention might be described as two new response set factors and each may have some pertinence to creative abilities as well as to communication abilities. For example, a person who scores high on Resistance to Idea Reduction may want to get a full firsthand feel of a phenomenon himself without being satisfied with an extracted version or briefing from someone else. He may also be good at second order revisions and corrections to bring about greater precision on the contributions already made by someone else. In contrast is the person scoring low on Resistance to Idea Reduction. He may be the one most capable of dropping out some of the details and thereby freeing himself to "sweep effectively with a broad brush" to extract and sketch the general trends and general principles functioning in a heretofore unorganized chaotic area.

The almost unfocused set of Broadly Diffused Attention has been described by many creatives in the classical literature as being present during their creative processes, especially prior to and during the crucial period of attaining insight. This wide and perhaps sweeping and searching focus (or almost lack of focus) seems to enable almost full input and almost non-restricted mixing and blending of the stuff being processed, received, and otherwise worked upon by the mind at the time. Perhaps he who can sustain this state of Broadly Diffused Attention for the longest time or at least be in this state for the highest percentage of his time before the moment of insight will thereby generate the highest level of creativeness in the product of his mind. The opposite end of this factor, namely

a highly focused state of attention, seems to be present in creatives in the stages after the moment of insight according to our work to date on a Creative Process Check List (Ghiselin, Rompel, and Taylor, 1964).

In summary, fourteen factors including seven landmark, four new interpreted, and three uninterpreted factors were found. Some of the seven landmark factors listed previously were given an improved interpretation. Naming Facility had been found before in oral expression, but not in written expression tasks. The four new factors interpreted in Battery A were Listening Comprehension, Resistance to Idea Reduction, Idea Listing Facility, and Broadly Diffused Attention.

Another new finding in Battery A was that multiple factors were identified in the traditionally found unidimensional domain for vocabulary tests and also in the Ideational Fluency domain. For example, the Vocabulary test and Completion test, which inter-correlated .67, each loaded .30 or more on the same three of the fourteen factors found in Battery A, namely Associational Fluency, Listening Comprehension, and Verbal Knowledge. Looking ahead to the Battery B results we note also that the Vocabulary test loaded .30 or more on five of the thirteen Battery B factors.

There was no simple, well supported finding across all tests that required a reduction in verbal output, such as the two Telegram Writing tests, the two Revision tests, and the Outlining Abstracting tests, although one factor, Resistance to Idea Reduction, appeared strongly and had some, but not all, of these reduction scores in it. A second factor, Verbal Knowledge, may also be relevant in verbal reduction, since some extraction scores loaded on it.

Two of the expected landmark factors that did not appear as separate factors were Originality and Verbal Classification, although the former has a possible plausible appearance in Factor A, which was interpreted as a response set factor called Broadly Diffused Attention.

The factors found in both Batteries A and B will be compared and summarized at the end of the description of the Battery B study.

#### Inspection of Certain Battery A Correlates

A complete discussion of each and every relationship in the Battery A correlation matrix (Table 43 ) would be an insurmountable task. Yet at least some of the correlations in the matrix should

be discussed. The choice of those on which to comment is guided by certain observations which we have made and by ideas that have emerged from these observations. The matrix is presented also as a source of information for whatever purposes others might have besides those reported here. For example, from a methodological viewpoint the information may be used to aid in the choice and/or construction of tests and training exercises. Or the information may provide clues to support or generate hypotheses in future work.

It should be recognized that the tests employed in Battery A were fundamentally performance type tests of communications abilities. In several cases there were multiple measures of what would appear to be the same communication variable. The intercorrelations among some of these related measures will be discussed in this section. Battery B contained many of these same performance type tests and in addition contained several personality and peer-rating type measures of communication abilities. These will be examined in the Battery B discussion.

An examination of the Battery A correlation matrix leads to some interesting speculations, several of which grew from unexpected high or low correlations between variables where the opposite might have been anticipated. The first problem concerns the expectation that tests of the same kind of phenomenon should be highly correlated. In these tests the tasks appear to be almost, if not completely, identical in the two tests being correlated.

Naming Names and Naming States. In the Naming Names test the subject is to write as many names of boys or girls as possible in the two minutes of time allowed. In Naming States the subject is to write the names of as many states as he can in a three-minute interval. Perhaps with most of the adult population in the United States we are about as familiar with the names of the states as with the names of people, so that certain classes of individuals would not have distinct advantages in performing one task or the other. The question is, would the same relationships hold if somehow the particular content were not equally represented (e.g., naming countries, animals, or ethnic groups instead of states?) Or, using the same two tests, what would be the correlation for 10 year old children?

In some ways we might view variations in the topic as manipulating the level of difficulty of the tests. If the tests are extremely easy, as might be the case here, the correlation could simply mean a relation between writing speed, or the motivation to write, which presumably would not change much in the two tests. On the other hand, what we think of as increasing the difficulty may simply mean reducing the degree of familiarity. With these

considerations, the expectations are for a moderately high correlation, which was in fact obtained ( $r = .51$ ). However, this correlation is low when considering reliability expectations, so there are undoubtedly some differences between these two tasks which keeps them from being truly parallel to each other. The potential pool of names certainly differs in magnitude and there are few geographical clues to enable one to "fish out" names of boys or girls.

Suffixes and First and Last Letters. Both of these tasks require attention to the structure of the words, independent of their meaning. In Suffixes the task is to list words whose suffix is "tion," and in the First and Last Letters the specific task is to list words which begin with "C" and end with "T." Basically, the knowledge of a large number of words would facilitate this performance. This is not the only factor which determines the score, however. If this were the case we would expect a high correlation. In the case of the suffix, there is a certain "sound" associated with that ending, and whether or not a person utilizes this cue could be a factor. The same is true with words ending with "T," in which auditory recognition of endings such as "ent" or "ant" could be a factor. Whether or not these common cues were used in both tasks is not known. The second test had a sound clue for its beginning which may provide a better basis in searching aloud (though quietly aloud) for words than sound features at the end of a word. To the extent that common factors did play a role in each task, we would expect a positive correlation. Inasmuch as several features seem to be involved and the tasks were separated in time in the schedule of administration, it is possible that only some of these features overlapped. The correlation between these two tasks was only .36.

Similes I, Similes III (phrase 1), and Similes III (phrase 2). The greatest overlap here would be expected between the two Similes III tasks, inasmuch as the tasks are similar and they followed one another in time, which allows for a particular approach in the first task to persevere into the second. Changes in approach and differences in the content of the two given phrases, along with certain unpredictable and uncontrollable factors, could lower the correlation between scores on these two tasks. However, we would expect the correlations here to be higher between the two Similes III tasks than those between Similes I and either of the Similes III tasks, because the task differed in the two different tests. In Similes I the subjects wrote a single simile to complete each of a number of stimulus phrases, whereas the two Similes III tasks were just the opposite, i.e., to write as many similes as possible to complete a single stimulus phrase. This latter task might be viewed as more difficult than the former in three important ways. For one thing, each listing of a simile for one phrase reduces the number readily



available. Secondly, in Similes I the previous response is not relevant to the next one but in Similes III it is pertinent and "must be erased" in order to free a person to produce another relevant response--so the task becomes progressively more difficult. The third aspect, related to the first, is the fact that the subject is compelled to deal with a specific phrase and its content when one stimulus phrase is used, whereas in the task where many different stimulus phrases are used and only one response is required the subject may decide to skip those for which he did not have a readily available response. Thus he is not so restricted in terms of the content of the phrases. The content in these kinds of tasks becomes increasingly important with decreasing experience of the subjects: e.g., children may lack the experience necessary to deal with a particular topic given.

The two correlations between Similes I and the two Similes III tasks were .32 and .27, and the correlation between the two Similes III tasks was .50, all of which fits the expectations. However, the latter correlation casts doubts on how strictly parallel the two stimulus phrases were for the examinees.

Compounding Words I. Two different stimulus words were "man" and "sea." One of the most unexpected findings was the relationship, or more properly the lack of it, between these two parts of the same task. The correlation was only .08. Even though the general tasks in each case were apparently identical, the stimulus words used in the tests made them unrelated at least statistically. Presumably there were different underlying factors in each of these tasks, and these factors seem to have differed among the subjects from task to task.

Perhaps one major contributor to the lack of correlation is that the component "sea" does not have a host of common compounds and the individual must to some extent create them. Their correlations with Compounding Words II supports this hypothesis since scores on "sea" correlate higher with the more complex test of creating new compound words. On the other hand there are a number of compound words with the component "man" with occupations, e.g., mailman, postman, groceryman, iceman. When given this clue, of course, these individuals could list a number of compound words. Thus a determining factor here could have been something besides word fluency: the ability to pick up the clue.

"Man" could also more readily be used than "sea" as either the first or second word in the compound word formed and students might have differed in picking up and using this cue, which would have had affected their scores and the amount of individual differences found.



Sentence Building (1st page), Sentence Building (2nd page), and Sentence Fluency. The Sentence Building tasks are identical except for the two stimulus sentences. The task is to write sentences which both say the same thing as the stimulus sentence and use at least four of the same words in each of the responses. The given sentences are very compact and contain seven words, so that many different combinations of four or more words are theoretically possible. The difficulty of the task on the whole would seem to increase appreciably as each response is given, however, simply from a depletion of one's reservoir of possibilities, which did not seem to be very extensive for these subjects.

The Sentence Fluency test simply requires the re-expression of the same thought, with no restriction concerning the use of some of the same words. Thus, the reservoir of possibilities is not as limited as in the Sentence Building tasks. One only needs to bear in mind the conveyance of the idea or content. The Sentence Fluency task appears to be the simpler task of the two because of the absence of restriction of the use of four words.

There are several considerations which lead to the expectation that there would be significant relationships among these tasks. For one thing, in all three tasks the examinee had to pay attention to the thought or idea conveyed by the sentences. Secondly, motivation and interest might be involved, so that the number of responses would depend somewhat on the amount of effort exerted which might be about the same in these tasks. Thirdly, many of the same types of sentences used in Sentence Fluency would be acceptable in Sentence Building; however, one would probably have to modify those acceptable in the former task to fit the additional four-word requirement in the latter. A fourth consideration is that although the four-word requirement was imposed, there was abundant content to work with in the Sentence Building exercises so that by being wordy one could construct many acceptable sentences.

The Sentence Fluency responses were scored for quality as well as quantity and the relationship between the "quality" and "quantity" scores on this same test was .85. Thus, for practical purposes, the quantity score is sufficient, and it is the most easily obtained. It correlated .41 with the first part of Sentence Building and .35 with the second. The correlation between the two parts of the Sentence Building test was .45, which is not much higher. Thus the interrelationships among these three quantity scores are moderate and are all about the same order of magnitude. In other words, these three quantity scores are "parallel statistically" but at a low level, not at a high level of parallelness.

Letter Star I, Letter Star III (first formula), and Letter Star III (second formula). In Letter Star I each item is a formula of given first letters and of asterisks (representing any first letter) and the respondent is asked to write only one meaningful set of words to each of a number of different formulas. In the Letter Star III tasks the respondent writes as many different sentences or phrases as he can to a given single formula. There are advantages and disadvantages to either of these tasks, and it was hard to predict on which one person would obtain the higher score, thus presumably reflecting differences in difficulty. The means suggest that the Letter Star I task was more difficult, since its mean was about the same as those of the other two tasks, even though about twice as much time was allotted to the Letter Star I.

The advantage in Letter Star I, though, is that some of the same words can be used in each of the formulas. However, one cannot maintain the same "set" throughout (as is possible with the single formula) since each formula is different, and some formulas could be more difficult than the single given formula in Letter Star III.

Difficulty probably cannot be measured simply in terms of the number of words required in the formula, but more directly in terms of the number of given first letters to be complied with. The difficulty probably increases, especially in Letter Star III, as a function of the depletion of one's reservoir with each response. Perhaps several of these features, rather than a single one, constitute the component of difficulty which differs somewhat across the two separate Letter Star tests.

The requirement in Letter Star III that the same words cannot be used again makes the task more like that in Letter Star I. In a sense the individual must "start from scratch" again each time when he thinks about his next sentence or phrase. The advantage, however, is that the number of words required in the formula is always the same and also that the given first letters in the formula are always the same for all responses in Letter Star III, though differing for each formula in Letter Star I. These features about the tests lead to the prediction of at least moderate correlations among these three measures, all of which in fact were between .45 and .50. In other words, the apparently greater difference between Letter Star I and the two Letter Star III tasks was no greater than between the two latter and superficially "more parallel" tasks.

Telegram Writing I, Telegram Writing II, Revision II, Abstracting, and Outlining I. All of these five tests were scored for what may be considered a common feature, an extraction of ideas plus a reduction of expression. They all called for the retention of key ideas or the reproduction of ideas contained in the original

materials through writing their answers in their own words. In the telegram writing tasks the examinees were given descriptions of events in some detail and the task was to write brief telegrams describing these events. In Telegram Writing I the examinee was told that the number of words over 10 would cost him extra money. In Telegram Writing II the examinees were required to use 10 words or less (only 10 blanks for words were available). In either case some motivation to use ten words or less was present in both tests, although the mean number of words used in Telegram Writing I was higher. Since these tests were scored alike and the conditions and requirements seemed to be similar, high relationships were anticipated on the three scores of number of ideas transmitted, number of words used, and the ratio of words used per idea. However, one feature that was different between the two tasks which could be crucial was the subject matter. One dealt with a description of a Rose Bowl Game, and the other with an emergency surrounding an airplane crash. Familiarity or knowledge with such events could affect performance. Another possible reason for the expectation of some reduction in the correlations is the relatively small range of scores. The correlation coefficients between the scores on the two tests were .28 for number of ideas transmitted, .19 for number of words used, and .15 for ratio of words used per idea. Frankly, the lowness of these correlations was surprising and troublesome.

The restrictions on the number of words to be used is not as apparent in Revision II, Abstracting, and Outlining I. The number of words used, of course, generally tends to increase with the number of ideas retained. The correlations between the two scores of ideas versus words bear this out both within Revision II and within Abstracting, where they were .80 and .60, respectively. It would seem then, that stringent restrictions on the number of words one could use affected differentially for different people the tendency to retain ideas. Perhaps the loosening of such restrictions would allow the tendency to retain or not to retain ideas to become manifest, so that it would be equally potent in two tests with the loose restriction. Apparently this was not the case, at least not clearly so, because the correlation between the idea retention scores from the Revision II test and from the Abstracting test was only .19. Outlining also does not impose an extensive limitation on words and its idea retention score only correlates between .16 and .26 with the other four idea retention scores. A "tendency to retain ideas," therefore cannot be conceived to be a general characteristic at this point but strongly appears to be specific to the kind of task involved. Perhaps this tendency to retain ideas must be called for very explicitly and directly in the test if it is to emerge with any consistency across tasks, instead of vaguely with no key emphasis upon it.

With the exception of Outlining I, these exercises were also scored for the number of words used and the ratio of the number of words per idea. The six intercorrelations among the four scores on the number of words used ranged from .01 to .19, a fact which indicates that conservation or the liberal use of words was not a general characteristic but was specific to each of the particular tasks. Likewise the lack of any high correlations among the four scores on the ratio of words per idea (ranging from -.06 to .16), indicates that perhaps these scores are also task specific as one might expect from the correlations among the other types of scores in these reduction tasks. Overall, it is puzzling to find such low relationships among several scores on idea extractions, among several scores on number of words used, and among several scores on compactness (or wordiness) of expression. This area warrants intensive and thorough studies to increase our present insights.

These are some of the new findings in Battery A which we felt to be a provocative and fruitful study in terms of the overall objectives of our program of research on communication abilities.



## CHAPTER V

### THE BATTERY B STUDY

Battery content. The hypotheses developed in the planning stage of this study implied that peer ratings, self-ratings, and self-reports on selected personality traits were possible predictors of communication abilities. Gough<sup>2</sup> found that adjective check lists, TAT ratings of originality, rigidity scales, interest scales, an MMPI social status scale, and several other scores correlated significantly with his general rating of "ability to communicate." The hypotheses and related studies provided the impetus for the complex assortment of tests and ratings included in Battery B. Battery B included Kerr's Empathy Test, a Manifest Anxiety Scale initially derived from the MMPI, a Test of Insight scored for achievement motivation, a Sociometric Questionnaire with five parts, several new self-report devices, a few of the new ability tests, and a selected subgroup of tests to measure the important landmark factors that appeared in Battery A. Some tests were common to both Batteries A and B, to permit a cross-comparison of the factor patterns obtained. With certain landmark factors appearing in both batteries, it was hoped that some factors could be identified as common to both batteries of tests. However, fewer landmark factors and fewer tests of these landmark factors were retained in Battery B to make room for the various self-reports and rating devices.

The 35 tests and rating scales in this battery provided a total of 82 scores. Twelve of these instruments were experimental self-rating forms, fifteen were experimental ability tests, six were selected reference tests which would identify certain landmark factors, and one was a sociometric device yielding peer ratings on five scales.

Table 44 in Appendix III gives the names of the tests and scales and indicates the 82 scores, the sequence number of the scores in the battery, the factor content of the landmark test scores, the means and standard deviations, and also the communalities ( $h^2$ ) where available from the factor analysis study. A more complete description of these tests can be found in the earlier cited Table 41 in Appendix III of this report. Table 10 lists the 35 testing devices categorized according to reading, listening, writing, self-report, and personality types of measures. The number of scores per test is indicated in parentheses. All tests common to both Batteries A and B which are one reading, both listening, and all but one

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<sup>2</sup>Gough, Harrison - from data received in a personal communication.



Table 10

PREDICTORS IN BATTERY B

Reading (4)

- Skimming (2)
- \*Vocabulary (1)
- Word Knowledge (1)

Listening (2)

- \*Auditory Retention (1)
- \*Speech Sound Discrimination (1)

Self-Report (26)

- Adjective Check List (2)
- All-Round Ability (4)
- Biographical Information Blank (4)
- Interest Scales (4)
- Phrase Check List (2)
- Satisfactory Ability Scales (8)
- Speech Attitude Scale (1)
- Writing Attitude Scale (1)

Personality (10)

- A Test of Insight (1)
- Empathy (1)
- PE Scale (2)
- Qualities of a Superior Speaker (1)
- Sociometric Questionnaire (peer ratings) (5)

Writing (40)

- \*Abstracting (3)
- \*Brick Uses (2)
- \*Compounding Words II (5)
- \*Consequences (2)
- \*Letter Star II (2)
- \*Naming Names (1)
- \*Naming States (1)
- \*Outlining I (1)
- \*Revision II (3)
- \*Sentence Building (2)
- \*Similes II (2)
- Social Institutions (3)
- \*Telegram Writing I (3)
- \*Telegram Writing II (3)
- \*Topics (2)
- \*Word Association (3)
- \*Word Story (2)

\*Tests common to both Batteries A and B.

writing test are asterisked. This table clearly shows that the emphasis in Battery B was nearly equally balanced between writing tasks and self report or other personality devices.

All of the tests in the study were related to some hypothetical construct developed in the planning stages of the work. Only one measure of Similes, Letter Star, Revision, and Compounding Words exercise was included here. Differential performance on these exercises was designed into the Battery A study by including what was termed a "fan effect." To save testing time only one of each of these "fan" series was included in Battery B. Other tests that were also felt to be important could thereby be included.

Sample and test administration. Battery B was administered to 305 airmen at Lackland Air Force Base out of whom 295 composed the final sample. The testing was fairly similar to that of Battery A except that the self-reports made the battery much easier to proctor and administer. As a consequence it was possible to test more subjects concurrently, namely about 150 subjects in each of two administrations of the battery. Battery B involved only two days, one day for each group. Fortunately, the same group of well trained proctors used in the previous testing were made available for the administration of Battery B.

The time limits set during the Battery A testing were adhered to precisely for all of the tests common to both batteries. The new tests in Battery B were watched closely, and the final time limit for each new test was determined on the first group of examinees. The self-report devices were untimed and everyone was permitted to finish these.

A description of the subjects with regard to age and education is contained in Table 11 below. As in Battery A, the sample was homogeneous with regard to military training. However, when compared to Battery A, a slightly higher proportion of subjects in Battery B showed some college education, and there was a compensating lower proportion in the "grade school completed" category.

Table 11

BACKGROUND OF BATTERY B SAMPLE

<u>Education</u>	<u>Number</u>	<u>% of Sample</u>
Grade School Incomplete	6	2
Grade School Completed	136	44
High School Completed	105	34

Table 11 (Con't.)

<u>Education</u>	<u>Number</u>	<u>% of Sample</u>
College--1 year Completed	34	11
2 years Completed	19	6
3 years Completed	3	1
4 years Completed	2	1
Over 4 years	0	0
Total number tested	305	
Number omitted because of 1 or more illegible papers	<u>10</u>	
Total number in final sample	295	

The data from only ten subjects were not retained for analysis from those tested. As in the Battery A sample, the test data from these men were eliminated either because their writing was illegible or because they misunderstood the instructions on one or more tests, thereby making it impossible to obtain a meaningful score on all of their tests. In the sample for Battery B, fewer people were eliminated because of this restriction than in the sample for Battery A.

Statistical analysis. The tests appearing in both Batteries A and B were scored alike, with the same number of scores. In a few instances, additional scoring methods were also attempted, and occasionally one of these new scores was used in the correlational analysis of the battery if it met the criterion of moderate independence from other scores on the same test. The results on the common scores across the batteries can be viewed to yield a reliability check of the studies.

The 82 scores in Battery B were intercorrelated on the SWAC. The resulting correlation matrix appears in Table 45 in Appendix III, with a correlation of .15 being significant at the .01 level for these data. As in Battery A, the correlations were generally of modest size, but many significant correlations were again apparent. Table 12 shows the frequency of positive and negative correlations of different magnitudes for Battery B.

Since the electronic computer program at the time was limited in capacity, only 64 variables could be analyzed in the factor study for Battery B. As in Battery A, the correlation matrix was examined and certain overlapping scores were eliminated. Those which overlapped excessively with other scores were excluded from

Table 12

FREQUENCY DISTRIBUTION OF CORRELATIONS  
AMONG BATTERY B SCORES

<u>Magnitude of r's</u>	<u>Frequency of Positive r's</u>	<u>Frequency of Negative r's</u>
95-99	4	0
90-94	4	0
85-89	2	0
80-84	4	0
75-79	6	0
70-74	11	0
65-69	0	2
60-64	5	1
55-59	25	1
50-54	24	3
45-49	36	3
40-44	80	3
35-39	128	8
30-34	217	19
25-29	264	38
20-24	395	62
15-19	409	84
10-14	368	169
05-09	314	221
00-04	<u>225</u>	<u>186</u>
TOTAL	2521	800
GRAND TOTAL of positive and negative correlations		3321

the final intercorrelation matrix to be factored. The identification numbers of the 24 scores thus eliminated are enclosed in parentheses in the correlation matrix. The reduced matrix of order 58 was factored in the SWAC to 13 significant factors by the complete centroid method. The unrotated factor matrix for this group of tests was then rotated on the SWAC by Thurstone's analytical rotational solution.

Interpretation and discussion of the Battery B factors. The tests scores having significant loadings on each rotated factor were assembled in a convenient form for study and factor interpretation. The details of the Battery B factor analysis are presented in Appendix II.

As indicated earlier, the desire to include many new predictor tests made it necessary to exclude some of the landmark tests in Battery B. Where two tests were used as reference variables for a factor in Battery A, only one was usually included in Battery B, making a less powerful reference for identifying the landmark factors. In such cases, there would have to be a sufficiently high relation between the landmark test and one or more of the new scores for that landmark factor to appear.

Nevertheless, some of the same general results as found in Battery A with regard to the traditional factors were found in the Battery B study. For instance, vocabulary tests had significant loadings on more than one factor, and this finding supported the Battery A finding that the Verbal Knowledge domain had been "broken up" into multiple factors.

Some of the other Battery B factors differed from a priori expectations, as also occurred in some Battery A factors. Somewhat different results might have been obtained in a few instances if more reference tests had been employed. Nonetheless, Ideational Fluency, Listening Comprehension, and Verbal Knowledge appeared as landmark factors similar to those in Battery A and Verbal Originality is similar to Originality factors found in other previous studies.

Several new factors were identified in the Battery B study, such as Verbal Superficiality, Wordiness of Expression, and five self-report and one peer report factors. Certain of these factors support some of the hypotheses formed early in the research. Twelve of the thirteen rotated factors were interpreted and given the names (and letters) in the following list. The four previously found factors (including those found for the first time in Battery A) are placed first and are marked with an asterisk.



*Ideational Fluency (A)	Self Estimate of Expressional Ability (G)
*Listening Comprehension (B)	Self Estimate of Writing Ability (H)
*Verbal Knowledge (C)	Negative Self Report on Communication Traits (I)
*Verbal Originality (D)	Aspiration in Communication Abilities (J)
Verbal Superficiality (E)	Empathy (K)
Wordiness of Expression (F)	Peer Ratings of Communication Abilities (L)

Five of the factors are writing factors and five are self reports or other personality factors, as would be expected by the balance of the tests constituting Battery B. Though there was a split between these two main types, a few self report test scores appeared on two of the writing factors and on Listening Comprehension. Conversely, a few writing scores loaded on Self Estimate of Writing Ability and on Empathy, but not on the other four non-ability factors.

In addition to the self report factors there is a separate peer report factor, tentatively interpreted as Peer Ratings on Communication Abilities which indicates that apparently the subjects in this study did not see themselves as their peers saw them.

Three of the other six factors are also factors found for the first time in this project. They are interpreted as: Listening Comprehension (also found in Battery A), Wordiness of Expression, and Verbal Superficiality. All three emerged in Battery B. Two of six landmark factors were again interpreted in Battery B as they were in Battery A. They were Verbal Knowledge and Ideational Fluency. On the other hand the landmark factors of Associational Fluency, Expressional Fluency, Spontaneous Flexibility, and Sensitivity to Problems did not come through in Battery B, perhaps, because there were not enough other scores containing these factors to have them emerge.

It should be noted that the Vocabulary test again loaded .30 or more on multiple (5) factors. They are: Listening Comprehension (.42), Verbal Knowledge (.59), Verbal Originality (.31), Self-Estimate of Writing Ability (.32), and Empathy (.32). The Word Knowledge test had almost the same factor loadings though a little higher, so it also was factorially complex. The fact that the Vocabulary and Word Knowledge tests tend consistently to load on multiple factors indicates their complexity and relevance to several areas of communication.

A detailed inspection of the correlation table for Battery B will permit the interested reader to obtain a better feel of the interrelations found among the great variety of measures in this study. Of special interest would be the correlates with some of the short and quickly obtained self ratings and also the intercorrelations among the different self reports within and across channels of communication. Another possible type of comparison is between the already existing tests of personality and the new self report measures specially constructed for this project. Some of these comparisons are made in the next chapter which takes stock of the findings across the two studies on Batteries A and B prior to moving ahead to the validation studies in Battery C.

## CHAPTER VI

### SUMMARY OF THE FACTORS IN BATTERIES A AND B

In reviewing the two studies on the relationships among predictor scores, it can be seen that there were 19 tests yielding 42 scores which were present in both Batteries A and B. After correcting for this overlap, a total of 50 tests yielding 105 different scores appeared in at least one of the two batteries through the correlational analysis stages. Because of computer limitations, the total number of scores used in the two factor analyses was reduced to 80 separate scores across the two studies. None of the tests, but only some of the multiple scores per test, were deleted for the two factor studies.

All the factors found in the two batteries are summarized in Table 13. In the two combined studies across the 80 separate scores there were 20 different factors. The 20 factors included 7 landmark factors (although Naming Facility had the new feature of occurring in written rather than oral tests) and 13 new factors, including 6 subjective factors appearing mainly in reports by self and peers. The three factors common to both batteries were Verbal Knowledge, Ideational Fluency, and Listening Comprehension. In addition, there was some cross linkage as well as some difference between the Resistance to Idea Reduction factor and the Wordiness of Expression factor. Some similarities are present between the Idea Listing and the Verbal Originality factors. The four uninterpreted factors, three from Battery A and one from Battery B, are omitted from the table.

The classification system used in Table 13 was subjectively formulated and was obviously not derived from an empirical analytical basis (as is the case when first order factors are classified according to second order factor findings). Guilford's (1964) structure of the intellect was not used as a basis of classification because all of the new factors would not fit readily into his system.

In the brief summary at the end of the Battery A study it was reported that 11 factors were interpreted in that study. These included four new factors--namely, Listening Comprehension, Idea Listing Facility, Resistance to Idea Reduction, and Broadly Diffused Attention, plus seven landmark factors--namely, Verbal Knowledge, Expressional Fluency, Associational Fluency, Word Fluency, Ideational Fluency, Naming Facility, and Spontaneous Flexibility.

Table 13

## OUTLINE OF THE FACTORS IN BATTERIES A AND B

<u>Channel</u>	<u>Factors</u>	<u>Battery</u>	<u>Nature of the Factors</u>
Reading	Verbal Knowledge	A, B	Recognition of meaning of word and written discourse presented visually
Listening	*Listening Comprehension	A, B	Understanding and recalling meaning of verbal materials presented orally
Writing	Ideational Fluency	A, B	Facility in expressing a quantity of ideas in meaningful context that meet minimum quality requirements
	Expressional Fluency	A	Facility in producing expressions
	Associational Fluency	A	Facility in producing associations
	Word Fluency	A	Facility in producing words according to their structural features
	*Idea Listing Facility	A	Facility in listing a series of relevant ideas
	Naming Facility	A	Facility in expressing the names of existing things and in attaching suitable names to ideas
	Spontaneous Flexibility	A	Degree to which flexibility spontaneously occurs where instructions do not call for it explicitly
	*Broadly Diffused Attention	A	Degree to which a person shown widely dispersed attention in his response set
	*Resistance to Idea Reduction	A	Degree to which a person tends to retain all the given ideas in a task stressing brevity of expression
	*Wordiness of Expression	B	Degree to which a person uses a high ratio of words per idea in tasks stressing brevity
	*Verbal Superficiality	B	Tendency to produce and use words on a relatively superficial basis when organization and continuity are not stressed

Table 13 (Con't.)

<u>Channel</u>	<u>Factors</u>	<u>Battery</u>	<u>Nature of the Factors</u>
	*Verbal Originality	B	Originality especially in the use and creation of words
Peer Report	*Peer Ratings on Communication Abilities	B	Sociometric ratings by peers of one's communication skills to reading, writing, listening, and speaking
Self Report	*Self-Estimate of Expressional Ability	B	Self-rating of one's favorable characteristics in both oral and written expression
	*Self-Estimate of Writing Ability	B	Self-rating of relevant background and skill in writing--complex, so only tentatively interpreted
	*Negative Self-Report on Communication Traits	B	Willingness to report negative aspects about oneself, such as anxiety and expressional weaknesses
	*Aspiration in Communication Abilities	B	Relative amount of aspiration toward attaining greater communication skills
	*Empathy	B	Tentatively interpreted as ability to empathize with others--complex, may be communal awareness

\*Each asterisked factor was found for the first time in this project.



In Battery B there were six new factors that were primarily rating factors (self-report and peer ratings) and also six ability factors, including two landmark factors and the Listening Comprehension factor from Battery A. In summary, 9 of the 12 interpreted factors in Battery B were new factors. In nearly half of the rating factors there was at least one ability score with a significant loading, and conversely in half of the ability factors at least one rating score appeared with a significant loading. Ideational Fluency and Verbal Knowledge were the landmark factors that emerged in Battery B, and Listening Comprehension had been found previously and for the first time in Battery A. Verbal Originality, Wordiness of Expression, and Verbal Superficiality were the three new ability factors found in Battery B. The sociometric scores yielded the factor on Peer Ratings of Communication Abilities. The five self-report factors were Self-Estimate of Expressional Ability, Negative Self-Report on Communication Tasks, Aspiration in Communication Abilities, Self-Estimate of Writing Ability, and Empathy, the latter two being somewhat mixed types containing both self-report and ability scores.

In looking for similar features across the factors, it can be noted that practically all of the twelve writing factors in the two studies involved some flexibility characteristics, and most of them required expanded production and stressed quantity of output, thus being fluency (expansion) factors in at least one sense. The two writing factors that appeared in tasks entailing reduction of given materials were the Resistance to Idea Reduction factor and the Wordiness of Expression factor. The large majority of the writing factors could be interpreted as involving critical-mindedness, as could the two self-estimate factors, the negative self-report factor, and perhaps the Verbal Knowledge and Listening Comprehension factors. Two factors, Spontaneous Flexibility and Broadly Diffused Attention, are interpreted as response set factors.

#### Discussion of Self Reports and Other Personality Scores

As mentioned previously, in addition to some of the more conventional performance (aptitude) type of communications tests employed in Battery A, several personality type tests of communication abilities were used in Battery B. Since a discussion of all variables and their intercorrelations would be a monumental task as well as somewhat repetitious, we shall restrict the discussion here to the personality type of tests not found in Battery A. Nearly all aptitude tests in Battery B were administered in Battery A, and the same interpretations and discussions as presented in the Battery

A discussion would seem applicable.<sup>3</sup>

The self-ratings, peer ratings, and selected personality self-reports will be examined in relation to their possible value in prediction of communication abilities. It should be understood that two tests which both load highly on a certain factor and thus appear from that one factor to be highly related are not necessarily highly correlated across all factors, so that the simplest way to determine the degree of relationship among these tests is to examine the correlation between them in the correlation table. In the present case both the factor analysis and the correlations should be examined to determine the relative contributions of tests to prediction.

The categorization of the abilities into reading, listening, talking and writing is convenient for discussing these non-aptitude tests. There were five tests which dealt with all four areas, two tests which dealt with talking, and two with writing. Although there were other self-judgment or peer rating types of tests which will be discussed, only these seemed to be relevant to the identification of the individual's present abilities.

Reading abilities. There were only four tests and scores of reading ability of the self-rating type, and only one of the peer-rating type, as shown in Table 14. They were: Biographical Information Blank, All-Round Ability, Satisfactory Ability Scale, Interest Scale, and Sociometric Questionnaire. Incidentally all of these tests also contained items for scoring the other communication abilities. The intercorrelations among the reading scores were nearly all moderate, in the 20's and 30's. Here there were not enough measures or variation, so that, perhaps, interpretations at this time would be very tentative. These correlations do seem to indicate some degree of independence among measures of reading, something not generally recognized by people at large and something which was not as apparent for the measures of the speaking and writing. In other words there are several reading abilities rather than only one general ability to read. Unfortunately only two of

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<sup>3</sup>When the intercorrelations of the variables in Battery A were compared with those intercorrelations obtained among the same variables that were used also in Battery B, a high degree of consistency was typically found. There were some exceptions, however, among some variables which appeared to be somewhat restricted in their range of scores. There may have been some sign reversals among some of the ratio scores that may be due to the different programs used in the computer analyses. These sign reversals may have been read-out or program computational errors for such scores, since the absolute values of these latter correlations are consistent in both batteries.

these reading scores were included in the factor analysis and neither of them loaded more than .30 on any of the factors identified in Battery B. The computer limitations mentioned earlier and the decision on the elimination of variables from the factor analysis prevent further discussion of the reading variables in terms of the factor analysis. Again as in speaking and writing the Sociometric Questionnaire scores correlated only in the .20's with the other scores.

Table 14

READING VARIABLES IN BATTERY B

Variable #	Variable #				
	3	7	17	29	79
3	--	34	20	30	24
7	34	--	44	32	28
17	20	44	--	22	20
29	30	32	22	--	10
79	24	28	20	20	--

Listening abilities. The personality type tests for listening ability were: Biographical Information Blank, All-Round Ability, Satisfactory Ability Scale, Interest Scale, and Sociometric Questionnaire. Perhaps the most noticeable finding among the listening scores in Table 15 is the low correlations of the Sociometric Questionnaire score with the others. While all the other coefficients ranged from .25 to .43, those with the Sociometric score range from .07 to .16. Like speaking, for example, perhaps the "internal" subjective cues are not conveyed or do not become manifested in the "external" observable cues, so that high relationships can occur. This seems to be the case, at least for some people. As with the reading scores, again there were only five tests and scores of the self-rating and peer rating type included here, so that interpretations can only be tentative. Incidentally, none of the self-rating scores was included in the Battery B factor analysis, so that no discussion of these variables in terms of the factor analysis is possible. The Sociometric Questionnaire, however, loaded more than the arbitrary cut-off of .30 on Factor K, Peer Ratings on Communication Abilities.

Table 15

LISTENING VARIABLES IN BATTERY B

Variable #	Variable #				
	4	8	18	30	81
4	--	42	32	39	07
8	42	--	43	30	16
18	32	43	--	25	11
30	39	30	25	--	13
81	07	16	11	13	--

Talking abilities. There were seven tests yielding nine scores designed to measure talking abilities indirectly. They were: Biographical Information Blank, All-Round Ability, Interest Scales, Speech Attitude Scale, Phrase Check List (2 scores), Satisfactory Ability Scale, and Sociometric Questionnaire. The intercorrelations of these scores shown in Table 16 range from .17 to .60 (absolute value). It is interesting to note that the intercorrelations of the talking scores on these seven tests (excluding the Satisfactory Ability Scale and the Sociometric Questionnaire) were all within the range of .49 to .60. Moreover, the greatest differences among their correlations with each of the other four test scores were within a range of .17. In other words, the pattern and magnitude of the correlations of one test with the others was almost the same for the first five tests above.

When the factors are examined it is noted that these five tests of talking ability also loaded highly on Factor G, Self-Estimate of Expressional Ability. In fact, all four of the highest factor loadings came from four of these five tests, an indication that perhaps only one of these tests needs to be used to predict this factor.

An interesting facet of these tests (ratings) is that they only measure half of the communication process: i.e., they are measures from the speaker's point of view, and do not necessarily represent the measures from the recipient or the consequences or effects of the communication. This means that when a person feels he excels or is deficient in speaking ability, we still do not have much evidence as to whether or not he will be perceived in the same way from the receiver's point of view.

Although the Sociometric Questionnaire, a peer rating type of questionnaire, did not ask for ratings or rankings of speaking ability in the specific sense, as did the other speaking tests, it did cover some of the area by two scores--namely, the issuance of drill orders, commands, and other oral orders; and the ability to instruct. These are ratings from the receiver's point of view and their correlation with each other was .42. The correlation of these two scores with the other speaking scores were among the lowest found among speaking scores. All 14 of the correlation coefficients with the other test scores were .30 or lower. Of the 36 possible correlation coefficients examined here, 16 were below .30, so that the Sociometric Questionnaire speaking scores account for nearly all of the lowest correlation coefficients. This becomes more noticeable when a frequency distribution of all correlation coefficients among talking scores shows that 15 correlations were above .40.

Also the sociometric speaking measure did not load highly (.30 or more) on any of the same factors as the other speaking tests. Unfortunately there were the only speaking scores obtained from the receiver end of the communication process. More research is needed here to determine the nature of the relationships between the speaker's and the receiver's impressions of speaking ability in the various areas where this type of communication is vital--for example, in education.

Table 16

TALKING VARIABLES IN BATTERY B

Variable #	Variable #									
	1	5	15	27	40	54	55	78	82	
1	--	54	38	49	56	50	-31	26	25	
5	54	--	43	56	60	58	-48	28	30	
15	38	43	--	41	28	28	-28	17	18	
27	49	56	41	--	56	52	-39	23	25	
40	56	60	28	56	--	59	-53	24	20	
54	50	58	28	52	59	--	-39	20	19	
55	-31	-48	-28	-39	-53	-39	--	-25	-24	
78	26	28	17	23	24	20	-25	--	42	
82	25	30	18	25	20	19	-24	42	--	



Writing abilities. There were eight self-rating type scores from seven tests of writing ability. These tests were: Biographical Information Blank, All-Round Ability, Writing Attitude Scale, Satisfactory Ability Scale, Interest Scales, Adjective Check List (2 scores) and Sociometric Questionnaire. Here in Table 17 the absolute value of the correlation coefficients ranged from .05 to .57. Again the correlation coefficients of the All-Round Ability test with all other tests were similar to those for the Biographical Information Blank and the Writing Attitude Scale. Scores on these three tests also loaded highly on the same factor, Factor G, Self-Estimate of Expressional Ability, the same factor on which the speaking ability tests loaded. In addition the scores from the All-Round Ability Test and the Biographical Information Blank also loaded highly on Factor H, Self-Estimate of Writing Ability. The same general comments as for the speaking variables seem to apply here.

Table 17

WRITING VARIABLES IN BATTERY B

Variable #	Variable #							
	2	6	12	16	28	47	48	80
2	--	45	47	20	32	29	-08	26
6	45.	--	57	37	46	32	-08	44
12	47	57	--	30	50	47	-19	27
16	20	37	30	--	25	20	-05	18
28	32	46	50	25	--	27	-07	20
47	29	32	47	20	27	--	14	10
48	08	-08	-19	-05	-07	14	--	-09
80	26	44	27	18	20	10	-09	--

The Sociometric Questionnaire also asked for peer ratings of writing ability, so that again the paradigm of "giver and receiver" can be examined. Since almost two-thirds of the correlation coefficients were below .30, perhaps, much cannot be said about the low correlations of the sociometric score. One possible reason for the low correlations here is that the identification and designation of

the writing category may be more broadly interpretable than speaking (talking). To the raters the latter may be closely associated with public speaking, which may serve as a more narrow frame of reference from which to make judgments. Another possibility is that there may not be sufficient information for a large group of other persons to judge writing ability as well as they can to judge talking abilities. At least among the military population tested here, exposure to the writing of others is probably minimal, while exposure to at least some speaking (talking) is practically unavoidable.

### Self Report and Personality Scores Compared with Aptitude Scores

In a sense, then, this "personality" approach to the measurement of communication abilities offers another way of partially measuring these abilities. This approach tends to get at the subjective or introspective aspects of one's abilities, and the peer-ratings get at the overall impressions one makes on outside observers. In general, these rating scores are relatively independent of a good number of aptitude test performance scores, and perhaps this independence reflects the relative contribution of such affective variables as feelings and emotions to the communications processes and the evaluations of them. It is immediately obvious that more research is required in order to determine more fully the relationships among such variables of the personality and performance types.

We turn now to a discussion of some of the relationships found between these personality type tests and the performance (aptitude) type tests of the same communications abilities as identified above. In a general sense, we are concerned here with the relationships between these two types of tests.

The Battery B performance measures of reading ability were limited to a single test, Skimming Exercise, which yielded two scores. These two scores correlated .77, so that one might expect that the correlations for one with the personality type tests would be comparable with those of the other. This was in fact the case. These Skimming scores correlated fairly highly with the personality scores of writing, all being significant at or beyond the .05 level. The range was .11 to .45. Oddly the Sociometric Questionnaire score correlated the highest (.41 and .45) with the performance scores.

Since, in essence, there is only one test of performance, perhaps further attempts at interpretations would be only speculative. Certainly more measures of reading ability are needed if we are to understand this area better.

There were only two performance type tests of listening ability, with one score each. They were Auditory Retention and Speech Sound Discrimination. The range of the 10 correlations with the five personality type test scores of listening was .01 to .24. However, for the Auditory Retention score only one of the five correlations failed to reach the .05 level of significance. The correlation between these two performance test scores of listening ability was .35. From this it appears that when one rates oneself on listening ability, the reference seems to be much more from the viewpoint of comprehension or retention rather than discriminational acuity. But when persons rate other individuals on listening ability, they also seem to take acuity into account. Certainly more research is needed here to clarify these problems, since there is so little data here on which to make firm interpretations.

There were no speaking performance tests in Batteries A and B, but there were 10 tests which may be broadly considered as writing type tests of performance, yielding 23 scores. The number in parentheses identifies the number of scores obtained from each of the following tests: Topics (2), Telegram Writing I (3), Telegram Writing II (3), Word Story (2), Similes II (2), Letter Star II (2), Revision II (3), Sentence Building (2), Outlining I (1), and Abstracting (3).

Comparisons across aptitude and personality scores of writing yielded 184 correlation coefficients. The absolute magnitude of these coefficients ranged from zero to .31, with only 25 of them being .20 or over. Four of the personality scores accounted for 23 out of the 25 correlations over .20. These were the Adjective Check List, All-Round Ability, Writing Attitude Scale, and the Sociometric Questionnaire. Viewed in another way, only a few of the 25 writing performance scores correlated more than .20 with personality type scores on writing. It is interesting to note that for the Word Story test, the score on originality and clarity correlated negatively with all eight of the personality type scores. Another interesting point is that although the Sociometric Questionnaire scores did not correlate highly with the other personality type scores, it was one of the four personality type tests that accounted for the 23 correlations over .20 with writing aptitude scores, accounting for 6 of the 23. Incidentally, half of the 184 coefficients were below .11, the .05 level of significance for correlation coefficients. The general impression, then, is that

only a few of the personality type test scores of writing are correlated with the performance (aptitude) scores measuring writing ability.

In the two studies the vocabulary types of tests had significant loadings on 6 of the 20 factors--namely Verbal Knowledge, Associational Fluency, Verbal Originality, Listening Comprehension, Self-Estimate of Writing Ability, and Empathy. This analysis of vocabulary scores into several meaningful components was a consistent and essentially new finding, since the variance was distributed across multiple factors in both Batteries A and B.

The writing, listening, and self-report factors mentioned above are complex in the sense that they span from their primary area into the reading area as a result of the presence of the vocabulary tests in them. Other factors that have scores from different channels of communication so that they cut across two areas were: Resistance to Idea Reduction, Wordiness of Expression, and Broadly Diffused Attention. The most complex factors in the two studies were Empathy and Self-Estimate of Writing Ability, which both cut across three areas of the five covered in Batteries A and B namely, reading, writing, listening, peer and self reports.

One striking observation at this point is that the total communication domain has been shown to contain a large number of different dimensions (factors). Even though only group tests were used in Batteries A and B, there were at least 20 basic dimensions in common among the approximately 80 different scores (besides the numerous dimensions unique to each test score that would account for the balance of the reliable variance in each of the scores).

It can be expected that the Battery C study described in the next section will be even more complex than the previous two studies, since it not only sampled most of the Battery A and B areas but also involved individual and small group situational tests, which widened the previously covered communication areas and added several direct approaches into the important talking area. Many of these situational tests entailed actual speaking activities, which had been omitted in Battery A and had only been measured indirectly in Battery B. Consequently, Battery C was the only battery which contained direct measures of each of the four main verbal communication domains: reading, listening, talking (speaking), and writing. To these were added selected self reports, but peer reports were omitted since the subjects tested on Battery C did not know each other well enough to render such ratings.



## CHAPTER VII

### DESCRIPTION OF BATTERY C

#### Predictors in Battery C

In addition to criterion scores Battery C contained 25 predictor tests selected from Batteries A and B on the basis of relevance and apparent independence as determined by a thorough examination of the two intercorrelation matrices. The earlier hypotheses on communication abilities and the criterion situational tests being developed at that time were also taken into consideration as the final predictors were chosen. Because of deadlines, it became necessary to select the Battery C predictors before the factor studies had been completed for Batteries A and B.

A wide variety of tests were retained, and an attempt was made to span as much of the types of communication activities and variance in the two earlier batteries as possible. Tests which yielded multiple scores were preferred, especially if their different scores were quite unrelated statistically. In retrospect it was found that nearly all of the 20 factors interpreted in Batteries A and B were adequately represented in the predictor tests in Battery C by one or more of their higher loading tests. The one factor definitely not represented was Peer Ratings on Communication Abilities, since the sample to be tested had not interacted enough to complete the sociometric questionnaires which would yield the only measures of this factor. Single tests were also retained to measure three landmark factors that did not emerge in Batteries A and B--namely, Originality, Sensitivity to Problems, and Verbal Classification.

Because of the predictive purposes of this study, the landmark predictor tests were pruned to a minimum per factor, contrary to the ideal design of a factor analysis study, in which multiple landmark tests are recommended for each previously established factor used in the study. In the reduction of the number of tests to be used in the validation phase, many valuable instruments were undoubtedly omitted. This does not negate their potential value as predictors of communication skills. In fact, later when the Battery A and B factor studies were completed, a few of those tests not retained proved to have some of the highest factor loadings in either Battery A or B.

An attempt has been made in Table 18 to classify the 25 predictor tests and their 57 scores according to the same outline



used in the previous section for the meaningful factors found in Batteries A and B.<sup>4</sup> The total number of scores within each main category is listed in parentheses immediately after the category heading. As indicated earlier, no peer reports were included in Battery C.

Table 18

OUTLINE OF 25 PREDICTOR TESTS IN BATTERY C

<u>Reading</u> (3 tests, 3 scores)	<u>Listening</u> (2 tests, 2 scores)
Skimming Exercise (1)	Auditory Retention (1)
Verbal Classification (1)	Speech Sound Discrimination (1)
Vocabulary (1)	
<u>Writing</u> (12 tests, 27 scores)	<u>Self-Report</u> (4 tests, 8 scores)
Brick Uses (2)	All-Round Ability (4)
Compounding Words II (2)	Biographical Information Blank (4)
First and Last Letters (1)	Phrase Check List (2)
Letter Star II (2)	Satisfactory Ability Scale (8)
Outlining III (1)	
Plot Titles (2)	<u>Personality</u> (4 tests, 7 scores)
Revision II (3)	A Test of Insight (3)
Similes I (3)	PE (Anxiety) Scale (2)
Social Institutions (2)	Qualities of a Super. Speaker (1)
Telegram Writing II (3)	The Empathy Test (1)
Topics (2)	
Word Association (4)	

For each of the predictor tests the same scores were derived as had been done in Batteries A and B, with the following exceptions. Two new additional scores were obtained on Similes I, involving the total high level responses and the percentage of all responses that were high level. Two additional scores obtained from the Test of Insight were the "Need-for-Affiliation" and the "Need-for-Status" scores. Two new scores on the Word Association test were an average quality score and a score based on the variability in quality of the several responses per examinee. (This variability score differed in its scoring nature from all others used in the project.) Because of high intercorrelations found among the initial five scores on Compounding Words II, the number of scores was reduced to the

<sup>4</sup>It was purely happenstance in our assembling a widely spanning set of predictor scores that we ended up with a Heinz sub-battery of 57 varieties of scores.

two that had the greatest independence from each other. The two separate Skimming scores of correct pages and correct answers were combined to give a single, composite, correct-response score. The Telegram Writing II test was improved slightly before using it as Telegram Writing III in Battery C, and the Outlining I test was modified enough to warrant calling its replacement Outlining III.<sup>5</sup>

In summary, the predictor part of the battery was mainly composed of a variety of writing activities and self-ratings on communication abilities, other indirect measures of speaking abilities and relevant personality traits, two listening scores, and some reading variance in most of the scores, but with little direct emphasis on measuring reading abilities, except for a vocabulary test. As indicated above, 57 scores were deduced from these predictor tests for validation against the 27 criterion scores derived from 18 situational tests (to be described in the next sections). In addition to these 57 predictor scores, three talking "rate" scores which were treated as predictor scores were later derived from recordings on two situational tests. They were Rate of Oral Reading, Rate of Public Speaking, and Seconds Pauses per Minute of Speaking. All of these talking rates were computed in terms of the average rate per minute across the total time consumed. A more complete description of the derivation of these scores and their analyses will be given later.

Description of communication situations in the military. To select a set of criterion tests of a situational type, the research staff made a thorough survey of related studies concerned with small group testing. This preliminary survey emphasized the complexity of situational testing; yet many encouraging methods were found and general patterns for criterion test design and administration were formulated.

Some of the problems inherent in situational testing are that (1) they are quite complex and require a vast number of trained people to administer them; (2) they are usually not as structured as paper and pencil tests, which makes standard administration difficult to achieve from one session to the next; (3) the testing is time-consuming in that it usually requires between one-half hour and a full hour to obtain minimum performance on most situational evaluations; (4) many props, types of equipment, and actors must be included in the context of the situation in order to structure the situation realistically, and (5) reliable scoring is difficult to achieve because of its dependence upon the judgments of rater-observers, who have displayed many human tendencies to err in previous situational test projects.

<sup>5</sup>An Outlining II test was developed but was never used in any of the three studies.

From their own previous experiences in designing tests of this nature and after reading the literature, the research staff was prepared for test construction. The next problem was to decide on the set of situations which would most appropriately sample the abilities needed to communicate in the Air Force. These situational tests, regarded as intermediate criteria, were felt to be more closely associated with on-the-job performance than any other type of testing or observation that could be devised for laboratory administration.

The job analysis study conducted earlier in the project was reviewed as a step toward selecting representative military situations. In reviewing the activities extracted in the job analysis study, the research team studied first the behavior that was deduced from each communication activity; second, the frequencies with which situations occurred which required each communication activity; and third, the feasibility of designing a situational test which would measure each important activity. Gustafson, who helped briefly early in the project, grouped the communication requirements with regard to their intrinsic relationship to more inclusive general classifications. He studied the attributes together with their frequency in the Air Force job descriptions and subjectively grouped them according to a structure he formulated. This structure included planning and allocation activities, implementation activities, instructing activities, special knowledge skills, review and evaluation tasks, clerical and memory activities, military drill, and others. He computed the total frequencies for each general category, which were summations of the frequencies for the sub-parts. This interpretation of these data and others of a similar nature contributed greatly to the selection and design of the criterion situational tests. Gustafson's classification system of communication requirements is outlined into the 15 groups below.

Group I. High level planning and allocation activities (701).<sup>6</sup>

Plans and organizes activities (169)	Provides for use and control of equipment, space, and time (115)
Determines personnel and/or equipment requirements (114)	
Assigns personnel (47)	Designs organizational structure charts (61)
Establishes production standards, controls, and methods (187)	Plans filing and library systems (1)

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<sup>6</sup>The numbers in parentheses are frequencies.

Dispatches aircraft, vehicles (4) Schedules operations of radio networks (1)

Selects personnel (2)

Group II. Low level planning and allocation activities (398).

Assigns work--prepares schedules and assignments (328) Plans workloads (70)

Group III. High level implementation activities (342).

Interprets reports (213)

Implements procedures, policies (3)

Directs activities (68)

Maintains discipline (5)

Controls work flow (53)

Group IV. Low level implementation (390).

Supervises subordinates (384)

Enforces law, guards (6)

Group V. High level instructing activities--formal (377).

Instructs (193)

Presents oral briefings (11)

Conducts classes and conferences (84)

Lectures (5)

Informs subordinates (84)

Group VI. Low level or informal instruction activities (533).

Conducts on-the-job training (317) Demonstrates new equipment, techniques (28)

Orients new personnel (188)

Group VII. Special Knowledge skills (31).

Decodes and deciphers (4)

Interprets photos (2)

Develops identification characteristics of radio nets (3)

Prints and duplicates (10)

Makes sketches, templates (7)

Re-records, mixes sounds (2)

Operates alarm system (1)

Translates languages, oral and written (2)

Group VIII. Review and evaluation (661).

Evaluates performance--reviews work (265)	Discusses inspection findings--interprets (83)
Inspects and evaluates (214)	Rates personnel (96)
Checks safety conditions (3)	

Group IX. Clerical and memory activities (284).

Compiles source material (54)	Collects and prepares information (28)
Maintains records, files (200)	Distributes and handles mail (2)

Group X. Military drill activities (11).

Leads formations of troops in drills and parades (4)	Conducts ceremonies (7)
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Group XI. Troubleshooting (175).

Resolves technical problems (95)	Resolves personnel problems and situations (80)
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Group XII. Human relations activities (90).

Maintains morale (41)	Interrogates, counsels, interviews (15)
Administers tests (5)	
Cultivates interests (1)	Obtains background information about personnel (28)

Group XIII. Activities requiring basic abilities in reading, writing, speaking, listening (544).

Prepares or processes radio traffic (2)	Analyzes reports (135)
Edits and evaluates reports (7)	Serves as receptionist (4)
Prepares documents and manuscripts (25)	Serves on committees (37)
Receives and copies information by radio or telephone (25)	Transmits information by radio or telephone (23)
	Writes and prepares reports (171)



Transcribes information on status boards (1)

Computes statistics (10)

Analyzes textual features of radio messages (1)

Analyzes and verifies reports (7)

Prepares, disseminates information (22)

Prepares narrative of action photographed (1)

Prepares abstracts, extracts, and summaries (10)

Group XIV. Analytic powers not covered in the foregoing categories (354).

Develops and improves work methods and procedures (114)

Advises, makes recommendations (121)

Performs research and development (11)

Prepares and interprets charts, graphs, maps, specifications (108)

Group XV. Unable to classify accurately (128).

Cares for patients (17)

Coordinates activities (111)

As a result of the above study by Gustafson and the job analysis study conducted earlier, a set of communication requirements was tentatively selected for measurement. Each of this set was considered as an essential communication activities in the Air Force and the set of selected activities provided the most complete criterion set feasible for the study.

Criterion situational tests in Battery C. The staff began designing small group or individual situational tasks which would adequately measure these communication requirements. A large number of situations were considered with regard to (1) appropriateness, (2) ease of administration, (3) adaptability to scoring, and (4) degree of overlap with other situational tests. These situations generally sampled effectiveness in reading, listening, talking, and writing in typical military situations. Air Force specialists were contacted to comment on the proposed situations of the research group. These specialists agreed with most of the proposals of the research group and made only minor suggestions, which were promptly utilized in the final selection and design of the test situations.

Each test was designed by a group of specialists from the research team whose interests and professional training were closely related to the task involved. Test outlines were written which included instructions for subjects and for actors, descriptions of props, physical locus, and observation and scoring methods. Since

many communication tasks require more than one person, the situations often involved small groups of examinees. The situations were tried out in pilot studies, discussed with the total staff, and redesigned many times to eliminate difficulties. Preliminary versions of scoring sheets from each test were tried out and analyzed to determine their adequacy. The scoring sheets were revised when behaviors were observed in this preliminary testing that were not included in the scoring sheet, or when scoring sheet behaviors could not be adequately observed. When a test was thought to be well constructed, the group responsible for its design selected an appropriate location, built its props, and trained its actors, rater-observers, and assistants so that they were expert in the administration of their situations.

Graduate students were used as test administrators in nearly all cases, but occasionally a military person was utilized for some special task involving military training. High interest was retained throughout the preparation for testing by encouraging all the staff to make recommendations for improvement in any aspect of the entire program. These recommendations proved to be invaluable. Initially, the plan was to validate the selected predictor tests by administering Battery C to a sample of Air Force trainees. Some preliminary attempts were made to plan for this testing to occur at one of two Air Force bases, either at the March Air Force Base Instructors' School, where supplementary criteria could be obtained, or at Lackland Air Force Base, where basic airmen similar to those included in the samples for the Battery A and Battery B studies would be available as examinees.

The complexity of the situational tests made it almost impractical to attempt to conduct this phase of the study at any location other than at the University of Utah. Some of the considerations affecting this decision were: (1) the tests would require the services of a large number of trained administrators and raters for a period of three full days, (2) the personnel involved in the administration would need from one to seven days for practice and training, (3) a suitable physical plant was needed with a considerable number of separate rooms which had to be prepared well in advance for training purposes, (4) complex recording and observational equipment as well as bulky props would have to be set up ahead of the testing, and (5) the sample would have to be stable enough to be depended upon practically full time throughout the entire testing period.

When all tests were thought to be acceptable with regard to design, a complete dress rehearsal was staged at the Children's Health Center, the place chosen for the testing to ensure that all materials, props, and assistants were correctly placed. This

rehearsal occurred one week before the actual administration, allowing enough time for any needed changes. In the rehearsal the tests were set up exactly as they would be in the official testing. Some of the research staff moved through the series as though they were subjects. Final improvements were made and additional practice periods were set for a few of the situations which did not seem to be in final form. Particular attention was directed at standard administration and scoring procedures. Steps were taken to make certain that the rater observers and actors were fully trained in the instructions, methods, and procedures for attaining standard control of their situation.

Eighteen situational tests were finally chosen for the criterion set. All 27 criterion scores derived from these 18 situational tests are listed in Table 19 below in the outline previously used for the Battery C predictors. There were no self-reports or peer reports in the situational test scores. However, there were several talking (speaking) situations, so a talking category has

Table 19

OUTLINE OF SITUATIONAL CRITERIA IN BATTERY C

<u>Reading</u> (2 scores)		<u>Listening</u> (3 scores)	
69	VIII Planning Inform. Paper	71	X Control Tower Listening
74	XIII Reading Comprehension	72	XI Identification of Sounds
		73	XII Interview Listening
<u>Talking</u> (13 scores)		<u>Writing</u> (9 scores)	
58	I Conference	60	III Written Ideas
59	II Oral Reading of Instruct.	70	IX Written Exposition
61	III Oral Ideas	75	XIV Writing I
62	III Speaking Ability	76	XV Editing
63	III Distortion	78	XVIII Writing II
64	IV Instruction On-the-Job	80	Writing Organization
65	V Emergent Leadership	82	XVII Interest Rank
66	VI Communication	83	XVII Addition and Distortion
67	VI Status	84	XVII Ideas
68	VII Emergency Telephone		
77	XVI Admin. of Discipline		
79	III Total Errors		
81	Speaking Organization		

been added. The situations are numbered with Roman numerals from I to XVIII, and identification numbers of the 27 scores from these situational tests range in number from 58 to 84. The scores, rather than the situations, have been classified because the scores

for the same situation do not always fall into the same category.

Comparison of the predictor and criterion scores in Battery C. In comparing the previous list of criterion scores with the list for the Battery C predictors, it can be seen that there are approximately the same number of reading and listening predictors as there were reading and listening criterion scores; considerably more writing predictors than writing criterion scores; numerous self-report predictors but no self-report criteria; no actual speaking predictors (except the indirect self-reports) but numerous talking criteria; and no peer reports of either type. In the total battery of 84 scores, there were 5 reading, 5 listening, 36 writing, 13 talking, and 25 self-report scores. The detailed outline of the predictor tests and criterion situational tests for Battery C together with their derived scores is presented below in Table 20.

Table 20

OUTLINE OF ALL SCORES IN BATTERY C

	Total Scores	Predictor Tests	Predictor Scores	Criterion Situational Tests	Criterion Scores	Predictor Scores Adjusted to 4 Channels	Total Scores Adjusted to 4 Channels
Reading	5	3	3	2	2	8	10
Listening	5	2	2	3	3	7	10
Writing	36	12	27	5	9	33	42
Talking	13	--	--	8	13	9	22
Self Report	18	4	18	--	--	--	--
Other. Personality	7	4	7	--	--	--	--
	84	25	57	18	27	57	84

It should be noted that there are more scores per predictor test than per criterion situational test. In general, the predictor scores tended to be of a more pure analytical type, whereas the situational criterion scores tended to be overall, composite scores of performances on complex communication tasks typically found on the job. The set of predictor scores emphasize writing and self-report scores whereas the set of criterion scores emphasize talking scores primarily.



If the 18 self-report scores and the 7 other personality scores are judged to fall into one of the four main channels of communication, 5 are most nearly reading scores, 5 are listening scores, 6 are writing scores, and 9 are talking scores. With this adjustment in the previous outline, it can be seen that in the total battery there are an equal number (10) of reading and listening scores, twice as many talking scores (22), and four times as many writing scores (42). Or stating this more broadly, in Battery C there are 20 receptive (input) scores and 74 expressive (output) scores.

More detailed descriptions of the specific criterion situations selected and the scores derived from each of these situational tests are presented in Table 46 in Appendix III.

Description of the sample for Battery C. Several university groups of students were contacted in an effort to obtain commitments from volunteers for the experimental sample. Sixty people were needed to fulfill the minimum requirements of the contract but 83 people were recruited in order to allow for an expected "drop out" rate of about 20%. The subjects were obtained from the following groups: Air Force ROTC, English, psychology, and speech classes, and a Naval Reserve Unit located near the campus.

Techniques were used which would stimulate the sample to perform seriously during the testing. The entire sample was informed of the purpose of the study and of its subsequent value to the Air Force and to personnel and guidance programs, in general. To encourage the examinees further, a payment of ten dollars was given each one who completed the three full day sessions on successive Saturdays. A pleasant surprise was that 80 out of the 83 subjects came all three successive Saturdays in beautiful spring weather (after a hard winter), partly because they were fascinated by the wide variety of new communication activities that they were generally experiencing for the first time, especially in the situational tests. A profile of 84 scores comparing each performance with means of the experimental group was also promised (and eventually accomplished, accompanied by counseling about the scores). The latter information seemed also to be persuasive in stimulating repeated attendance at the testing sessions.

Since airmen with low ACB scores were eliminated from the Battery A and B samples, it was felt that the present sample was somewhat similar to the previous samples and thereby acceptable with regard to age, education, and other background factors. Table 21 gives the educational background of the Battery C group of men, which can be compared with the earlier tables on the samples for Batteries A and B. One difference was that there were more men with 1 and 2 years of college in Battery C.



Table 21

## BACKGROUND OF BATTERY C SAMPLE

<u>Education</u>	<u>Number</u>	<u>% of Sample</u>
Grade School Incomplete	0	0
Grade School Completed	8	10
High School Completed	28	35
College--1 year Completed	19	24
2 years Completed	17	22
3 years Completed	4	5
4 years Completed	2	2
Over 4 years	2	2
Total number completely tested	80	100

Administration of the Battery C tests. A great deal of time was spent in the training of actors and raters. Since a large number of personnel was required to administer the test, many of them, although professionally qualified in their specialties, were not initially adapted to our particular requirements. Coordination was a difficult problem, but very effective means for accomplishing this total task were devised, so that the rehearsals and final checkouts of the testing were carried out efficiently.

All testing on both predictors and criterion situations was accomplished on three successive Saturdays. As the subjects arrived, they were assigned to groups of four and were issued individual lapel tags which identified each man by his group, and his number within the group. Four men could receive instructions and each one could complete his individual performance in the shortest situation within one-half hour, the minimum time unit possible. These four men also formed the "group" where a situational test required a "group-of-four." A fairly elaborate and detailed schedule was devised to randomize the test order and to bring about a smooth flow across the situational tests with their different time requirements.

Descriptive statistics of the Battery C data. Battery C, the validation battery, was scored and subjected to certain statistical analyses. Means and standard deviations were computed for each score and are presented in Table 47 in Appendix III, with the 57 predictors listed first and the 27 situational criterion scores listed second. The communalities ( $h^2$ ) from the factor analysis are listed for each score. The table also indicates for each predictor score whether it had been used previously in Battery A or in Battery B or in both batteries.

A correlation matrix among all 84 scores was computed on the SWAC and is presented in Table 48 in Appendix III. With a complex battery of predictors and situational test criterion scores, one can see that the correlation matrix has different sections containing (1) intercorrelations among all predictor scores, (2) intercorrelations among all criterion measures, and (3) validity coefficients for each predictor score with each criterion score (that is, 27 validity coefficients for each predictor score or viewed alternately as 57 validity coefficients against each criterion measure). The next chapter presents the factor analysis of this correlation table. Then later in Chapter XII, a list of correlates with each criterion is given in an attempt to describe more fully each predictor and criterion score from the point of view of empirical evidence. These correlational results should be very worthwhile in increasing our understanding about communication abilities.

Table 22 lists the magnitude of all of the correlation coefficients in the matrix. A correlation of .22 or above is significant at the .05 level in the Battery C study. Less than one third of all these correlations were significant. Of course, the plan was to select a set of different predictors and a set of different criteria for this study. Therefore, in the section of correlations between predictors and in the section of correlations between criteria, it was hoped that most of the correlations would be negligible. But in contrast in the remaining section of predictors versus criteria, many significant validity coefficients were expected. However, if the criterion scores spanned many dimensions of communication abilities, the comparatively simpler predictor scores would not be expected to span many of these dimensions, so that on the average only a few significant validities would be expected for each predictor score.

The results on Battery C are presented in Chapter IX in terms of the relations found within and between the four main channels of communication namely, reading, listening, talking and writing. Chapter X highlights these correlational results in terms of the validities of each of the 57 predictor scores. The predictability of each of the 27 criterion scores is analyzed in Chapter XI and the correlates with each criterion score are also listed in this same chapter. Multiple correlation techniques are then applied four times for each criterion score to yield a best weighted battery of scores in each case for each criterion. These multiple correlation results in predicting each criterion are presented rather fully in Chapter XII, the final chapter covering the Battery C studies.

Table 22  
 FREQUENCY OF DISTRIBUTIONS OF CORRELATIONS  
 IN BATTERY C MATRIX

<u>Magnitude of r's</u>	<u>Frequency of Positive r's</u>	<u>Frequency of Negative r's</u>
95-99	0	0
90-94	0	0
85-89	1	0
80-84	0	0
75-79	1	0
70-74	7	1
65-69	8	1
60-64	7	2
55-59	15	3
50-54	25	7
45-49	39	8
40-44	59	11
35-39	107	22
30-34	146	17
25-29	235	35
20-24	287	75
15-19	387	119
10-14	437	149
05-09	403	248
00-04	<u>381</u>	<u>240</u>
TOTAL	2545	941
GRAND TOTAL of negative and positive correlations		3486

The two remaining chapters (XIII and XIV) cover a review of all results in the total project, including some implications and speculations that arise from these results, and present a summary and conclusions emerging from the project.

#### PARALLEL FORMS FOR THEME WRITING

From our many discussions with educators about our research, we sensed the problem of a need for a wider band of experiences and a greater variety of tasks for students. We further realized, as emphasized in the Title I (poverty) educational program that some fraction of the students in most classes are not being reached by the present methods and procedures and are thus not participating or growing in knowledge and abilities. Fortunately we recognized the opportunity of processing our data to see if we could analyze theme writing, a frequently assigned complex task, into several simpler components. This might open the way to building a set of easier training exercises which would provide almost parallel experiences to theme writing. Yet each of the tasks in the set could be simpler and the set would contain a great variety of new challenges to students who may have become fairly stereotyped and stabilized in their theme writing abilities and inabilities.

The first step was to select the Writing I situational score as the criterion for multiple correlation analyses, with the assumption that it adequately resembled typical theme writing activities. Eighteen aptitude-type scores had significant validities with the Writing I criterion scores.

Multiple correlations were then calculated by using only two predictor scores and using no score in more than one battery. This produced nine short batteries of two scores each, with a realization that the degree of theme-writing variance overlapped would be at a minimum from only a pair of predictor scores. The multiple correlations of two scores yielded an order-of-magnitude estimate of what could be expected if longer batteries were formed.

The nine multiple correlations are presented in Table 23 below, with the nine short batteries arranged in rank order according to the size of their multiple correlation. Inspection of the table demonstrates that scores representing relatively independent factors can be combined to predict the single criterion of "writing." The largest obtained multiple correlation of .64 is very promising while the smallest one of .31 is still significant. On the basis of these results, it was concluded that the overall ability to write a theme could be developed by modifying the communication tests into sets of training exercises. These exercises would employ independent

abilities across factors in order to overlap as much theme-writing variance as possible.

Table 23

Nine Short Batteries for Predicting Writing I Criterion Scores

<u>Battery C Scores</u>	<u>Pairs of Scores in Short Battery</u>	<u>Battery Validity</u>
35 22	Word Assoc.--ave. qual. Revision II--words/idea	.64
33 20	Word Assoc.--total Revision II--ideas	.59
45 53	Soc. Instit.--indirect Outlining III	.50
34 21	Word Assoc.--unpop. Revision II--words	.45
5 19	First and Last Letters Letter Star II--2 & 3 resp.	.42
9 11	Plot Titles--clever Topics--quantity	.37
12 52	Topics--change Skimming	.36
7 49	Similes I--total Comp. Words II--sound	.34
24 48	Similes I--high Comp. words II--total	.31

It was recognized that training exercises built from valid Writing I predictor tests would overlap theme-writing variance quite well. It was further realized that these exercises could provide some training for a variety of other writing abilities in their remaining variance.

This led to classroom demonstration studies which evolved from the present basic communication research findings and techniques, an effective illustration of the merit of bridging the gap between basic research and the educational system. Growth and expansion of



communication abilities were the major goals of this Communication Development Study in conjunction with simultaneous improvement in academic knowledge in the language arts. There was a special challenge to try to reach those "educationally deprived" students who had previously failed to make an appreciable showing in the language arts classroom. It was hypothesized that by furnishing students with educational exercises developed from measures in the present study covering some new dimensions of communication performance different from those that were presently being trained for in the classroom, an essentially new group of students would emerge as star performers. It was also believed that heretofore unsuccessful students might thereby be reached and that the new training exercises and procedures would lead them on a new road to achievement.

The communication training exercises were for the most part limited to written and oral expressional abilities. The exercises were arranged in a sequential format beginning with rather easy, independent abilities and proceeding to the training of more complex abilities or combinations of communication abilities. A final goal was an increase in achievement in theme-writing abilities. The training exercises proved to be effective in stimulating nearly all of the heretofore educationally deprived into good participation, even though many of these had formed a pattern by no longer attempting the task and dropping out of participation whenever a theme was assigned to be written.

In brief, this classroom demonstration study was quite successful and practically all results were significant and in the expected direction. The study showed the soundness of bridging the gap between research results obtained in this communication report and educational curriculum planning. As anticipated, the training exercises developed from the predictor tests also provided practice in other writing ability areas, giving the student a much wider variety of writing experiences. The study was a logical outgrowth of our educational theory presented briefly in the first section of Appendix I and illustrated effectively a key point in our theory of viewing the student as a "thinker" not merely a "learner," and of developing the "total keyboard of his mind."

## CHAPTER VIII

### COMMUNICATION FACTORS IN BATTERY C

#### Addition of Three Rate of Talking Scores

Battery C consisted of a total of 87 scores--30 scores from 18 live situational tests and 57 predictor scores from 25 predictor tests. After the other analyses were run, three additional scores concerning rate of talking were derived from the situational tests and were added as predictor scores to this factor analysis, the only analysis which included these additional scores. The scores were the Rate of Oral Reading, the Rate of Public Speaking, and the Number of Seconds in Pauses per Minute of Speaking.

The three new scores on rate of talking were correlated with all other 84 scores in the Battery and these intercorrelations are shown in Table 49 in Appendix III. It is interesting to note that, as expected, the amount of pauses per minute of speaking was negatively related to the rate of oral reading (-.43) and to the rate of public speaking (-.65). The rate of oral reading also correlated .42 with the rate of public speaking which indicates some commonness but also considerable difference between what is involved in these two rate of talking scores. Apparently the rate of oral reading with the material already provided is quite a different psychological task from the rate of public speaking where one must provide from within himself the material about which he will speak.

Quite understandably, the Vocabulary test is extremely highly correlated (.71) with the rate of oral reading of a given set of complex instructions, whereas, this same Vocabulary test only correlated .29 with the rate of public speaking in the lecture situation. A somewhat similar pattern exists for the All-Round Ability to Read. The speaking organization situational score derived from multiple situations has the reverse pattern of being more highly correlated with the speed of public speaking than with the speed of oral reading.

The rate of public speaking was much more related to performances in the conference situation than was the rate of oral reading which was essentially unrelated to the conference performance. Persons with lower ability in the outlining task tended to pause more frequently in their speaking. In fact, the pause score tended to be negatively related or unrelated to practically all performance measures--and it was negatively related especially with scores that correlated high positively with both the rate of oral reading and the rate of public speaking.

### Factor Analysis of all 87 Predictor and Criterion Scores

For the purpose of the factor analysis, it was decided to analyze all 87 scores together--both criterion and predictor scores. This large battery undoubtedly covers more comprehensively the communications domain than either the criterion scores or predictor scores alone. The complexity of communication domain is again displayed in the finding of 25 factors or dimensions of performance. To simplify the examination of the loadings, they have been arranged in decreasing magnitude, and only those whose absolute value was .22 or greater have been listed. This value is somewhat arbitrary, yet in terms of correlation coefficients (one possible interpretation of factor loadings), it is at the .05 level of significance and thus has some basis as a cut-off point.

An examination of the factor loadings shows that some situational tests obtained their highest loadings on some factors, and certain paper and pencil tests loaded highest on the other factors. This would seem to indicate that perhaps certain communications abilities might be best measured by situational tests and other abilities by paper and pencil tests. Also the factor loadings provide an indication of both the amount and the nature of the overlap between these criteria and predictors. Descriptions of the factors are presented below.

Factor A. Ideational Fluency. The tests with high loadings on this factor are as follows:

<u>Variable Number</u>	<u>Score</u>	<u>Factor Loading</u>
48	Comp. Words II--total	.78
49	Comp. Words II--sound	.75
7	Similes I--total	.67
8	Plot Titles--non-clever	.52
38	Brick Uses--total	.41
11	Topics--quantity	.37
83	Sit. XVII. Written Interp.--distort	.33
73	Sit. XII. Interview Listening	.30
85	Rate of Oral Reading	.28
37	Brick Uses--categ. chgs.	.28
33	Word Assoc.--total	.26
1	Satis.Ability--speak	.26
22	Revision II--words/ideas	-.24
36	Word Assoc.--qual. var.	.24
30	Diff. Score--write	-.24
45	Soc. Instit.--indirect	.23

This seems to be a fluency factor since most of the highest loadings reflect flow and quantity of output, including reading aloud at an above average speed and listening efficiently to flowing conversations in interviews. Tendencies to add to or to otherwise distort a message occur in the highly verbal, productive, fluent person who has more verbal associations, has a greater variability of associations than others have, and can change categories of his thinking more frequently and readily than others. He has a high minimum level to which he aspires in speaking ability but a low aspiration to grow in writing ability. Somewhat unexpectedly he is slightly less wordy in his expression of ideas. Other quality features also appear in this quantity of production factor since variables with the highest loadings also require the respondent to come up with fresh ideas. These new ideas in the Compounding Words II test, on the average, tend to be high quality ideas and expressions, including some positive sound pattern features. Indirect and thus less obvious ideas are also produced on the Social Institutions test. All of the Ideational Fluency tests appear here but this present factor also has some high quality production features to it. In summary, in this factor are flow and fluency of ideas, with some flexibility in shifting categories plus above average variability in responses, including the capability of producing some responses of high quality.

Factor B. Associational Fluency. The tests with high loadings on this factor are as follows:

<u>Variable Number</u>	<u>Score</u>	<u>Factor Loading</u>
35	Word Association--aver. qual.	.76
34	Word Association--unpop.	.70
33	Word Association--total	.51
36	Word Association--qual. var.	.40
41	Test of Insight--affil.	-.39
59	Sit. II. Oral Reading	.36
9	Plot Titles--clever	.34
8	Plot Titles--non-clever	-.32
80	Writing Organization	.30
67	Sit. VI. Desig. Leader--status	-.29
75	Sit. XIV. Writing I	.29
50	PE Scale--anxiety	.29
70	Sit. IX. Written Exposition	.28
85	Rate of Oral Reading	.27
83	Sit. XVII. Written Interp.--distort	.24
78	Sit. XVIII--Writing II	.23
52	Skimming	.23
30	Diff. Score--write	-.23
71	Sit. X. Control Tower Listening	-.22



<u>Variable Number</u>	<u>Score</u>	<u>Factor Loading</u>
5	First and Last Letters	.22
56	Biog. Info.--reading	.22

It is not too surprising to find a number of variables loaded on this factor, since the ability to associate would underlie many communication activities. The four highest loadings on this factor are all Word Association variables both in terms of quality and quantity of associations. Those who show a need for affiliation, those who make direct statements to their subordinates about their status (about who is boss), those who have low aspiration to grow in writing ability, and those who have difficulty in listening to messages through noise are below average in their quantity and quality of verbal associations. In contrast, those scoring high on this factor are good and fast oral readers, can produce clever titles to stories, do produce well organized high quality written materials, and are effective skimmers of printed material.

Factor C. Word Fluency. The tests which have high loadings on this factor are as follows:

<u>Variable Number</u>	<u>Score</u>	<u>Factor Loading</u>
82	Sit. XVII. Written Interp.--interest	.72
5	First and Last Letters	.65
38	Brick Uses--total	.37
86	Rate of Public Speaking	.36
6	Verbal Classification	.35
73	Sit. XII. Interview Listening	.34
41	Test of Insight--affil.	.33
11	Topics--quantity	.32
33	Word Association--total	.32
78	Sit. XVIII. Writing II	.31
22	Revision II--words/ideas	-.30
80	Writing Organization	.30
34	Word Association--unpop.	.29
16	Telegram III--words	-.26
14	Auditory Retention	.23
15	Telegram III--ideas	-.22
59	Sit. II. Oral Reading	.22

This factor seems to involve the fluency and effective use of words and ideas rather than the extent of vocabulary. This would seem to be the case with Interest Rank, First and Last Letters, Rate of Oral Speaking, Topics, Word Association, and several of the



other variables. This factor appears to be a complex one which includes primarily Word Fluency but also Ideational Fluency and Associational Fluency. Perhaps the latter appear because they are related factors. It is interesting to note that several of the variables loading on this factor are also loaded positively though lowly on the Expressional Fluency factor, again showing some low overlap among fluency factors. The fact that ideas and the ability to write interesting materials appear on Word Fluency is not an entirely new finding. Although this factor traditionally has been described as one in which words are produced according to their structure and independent of their meaning, Word Fluency has shown some validity in predicting the ability to produce meaningful verbal discourse.

Factor D. Expressional Fluency. The tests which have high loadings on this factor are as follows:

<u>Variable Number</u>	<u>Score</u>	<u>Factor Loading</u>
18	Letter Star II--1st resp.	.84
19	Letter Star II--2 & 3 resp.	.83
71	Sit. X. Control Tower Listening	.42
9	Plot Titles--clever	.34
11	Topics--quantity	.32
16	Telegram III--words	-.27
41	Test of Insight--affil.	.26
33	Word Association--total	.25
76	Sit. XV. Editing	.25
38	Brick Uses--total	.23
14	Auditory Retention	-.23

The two variables with the highest loadings are expressional fluency tasks which require the respondent to choose words that fit into a given structure and thereby make a statement that has meaning. For the Letter Star tasks, it appears that two structures must be simultaneously completed. One is mechanical, a sequence of words beginning with the given letters, and the other is semantic, an organization of meaningful content in the words used. In the other variables, such as Topics, Brick Uses, Plot Titles, Telegram Writing, and Editing, apparently only the content is structured. These considerations seem to indicate that this is a facility and somewhat general fluency factor. These tests measure ideational fluency and originality of expression, together with compactness or efficiency of expression. Associational fluency is also involved. The person high on this factor has some need to affiliate and is slightly below average in auditory retention.

Factor E. Flexibility. The tests which have high loadings on this factor are as follows:

<u>Variable Number</u>	<u>Score</u>	<u>Factor Loading</u>
12	Topics--changes	.85
42	Test of Insight--status	.46
6	Verbal Classification	.35
11	Topics--quantity	.34
58	Sit. I. Conference	-.23
65	Sit. V. Emergent Leader	-.23
47	Qual. of Super. Spkr.	-.23

The variables loading on this flexibility factor seem to indicate the ability to cover a broad area in responding. This would seem to be the case, especially with both of the Topics scores (Number of Changes and Number of Separate Responses). Verbal Classification would also seem to be facilitated by flexibility. Some fluency is also present. It is somewhat puzzling why performances in the Conference and Emergent Leader situations show negative (though low) relations. Possibly too much flexibility in group situations is reacted to unfavorably by others who may want definiteness in planning and organization and are troubled by too much flexibility and potential change in thinking and planning.

Factor F. Wordiness of Expression. The tests which have high loadings on this factor are as follows:

<u>Variable Number</u>	<u>Score</u>	<u>Factor Loading</u>
17	Telegram III--words/ideas	.91
15	Telegram III--ideas	-.66
52	Skimming	-.45
58	Sit. I. Conference	.26
65	Sit. V. Emergent Leader	.25
14	Auditory Retention	-.25
16	Telegram III--words	.24
45	Soc. Instit.--indirect	.23

The exceptionally high loading of Telegram Writing III--Ratio of Words to Ideas, on this factor seems to indicate the tendency to use more words than are necessary to express an idea. This notion is also supported by the negative loading of Number of Ideas and the positive loading of Number of Words on the same test. This wordiness in writing may extend into oral discourse for the more talkative, wordy person may have appeared to the evaluators to be performing above average in the comparatively short Conference and Emergent Leadership situations, where one who speaks up readily may

from early judgments and perhaps prematurely appear to be a leader. Such wordy persons are apparently below average in their ability to identify, extract, and retain key ideas, both in reading and in listening activities, as found in Skimming, Telegram Writing III, and Auditory Retention. Maybe such persons do not have as great a need for ideas because they have an ample ability to produce words-- or perhaps they have always had the opportunity to use ample words and have never faced the task or had practice in situations calling for compactness of expression.

Factor G. Tendency to Produce Superficial Ideas. The tests with high loadings on this factor are as follows:

<u>Variable Number</u>	<u>Score</u>	<u>Factor Loading</u>
44	Soc. Instit.--direct	.80
67	Sit. VI. Desig. Leader--status	.46
45	Soc. Instit.--indirect	-.38
7	Similes I--total	.36
37	Brick Uses--categ. chgs.	-.34
14	Auditory Retention	.29
6	Verbal Classification	.27
8	Plot Titles--non-clever	.25
5	First and Last Letters	.24
36	Word Assoc.--qual. var.	.23

This factor is called the Tendency to Produce Superficial Ideas in view of the high positive loading of Social Institutions-Direct scores and the negative loading of Social Institutions-Indirect scores. The former involves making suggestions for minor changes of an immediate nature, while the latter indirect score deals with suggestions which are far reaching. The presence of the non-clever score on Plot Titles also supports this interpretation. The loadings on the other variables seem to indicate a tendency toward an ability to produce ideas within the existing frame of reference. High scorers are direct and straightforward in their areas of selection of response, which apparently is positively related to status seeking verbal behaviors and to producing series of responses that do not rapidly or radically change categories. Such persons show above average variability in their word association responses so that they think up and are willing to express (instead of screen out) superficial ideas as well as higher quality ideas in their output.

Factor II. Speech Sound Discrimination. The tests which have high loadings on this factor are as follows:

<u>Variable Number</u>	<u>Score</u>	<u>Factor Loading</u>
13	Spch. Snd. Discrim.	.74
36	Word Association--qual. var.	-.32
26	All-Round Ability--write	-.28
30	Diff. Score--write	.27
70	Sit. IX. Written Exposition	-.25
47	Qual. of Super. Spkr.	.23
62	Sit. III. Lecture--speak	-.22

In view of the relatively high loading of the Speech Sound Discrimination variable, it is felt that this factor should be primarily identified with this variable. Other indicators on this factor are aspiration for considerable improvement in writing ability together with a slightly below average ability in speaking and in writing, with the latter showing up both in self ratings and in a situation test.

Factor I. Distortion Tendencies. The tests which have high loadings on this factor are as follows:

<u>Variable Number</u>	<u>Score</u>	<u>Factor Loading</u>
63	Sit. III. Lecture--distortion	.81
38	Brick Uses--total	.44
16	Telegram III--words	-.29
15	Telegram III--ideas	-.26

This factor is called Distortion Tendencies on the strength of the exceptionally high loading of the Situation III--Addition and Distortion Scores, where additions of one's own can be considered to be distortions. The small but negative loadings of the two Telegram Writing II tasks would also tend to support this notion. In the sense that there is an above average loss both in ideas and words (which are additional forms of distortion). The other significant factor loading pertains to a measure of fluency in writing as well as fluency in production of sheer quantity of ideas of one's own. It is logical to expect that highly fluent as well as ideational fluent persons might prove to be distorters of given messages as they receive, process, and transmit them.

Factor J. Attention to Detail. The tests which have high loadings on this factor are as follows:

<u>Variable Number</u>	<u>Score</u>	<u>Factor Loading</u>
79	Sit. III. Lecture--errors	-.76
71	Sit. X. Control Tower Listening	.37
37	Brick Uses--categ. chgs.	.34
6	Verbal Classification	.34
70	Sit. IX. Written Exposition	-.27
47	Qual. of Super. Spkr.	-.26
14	Auditory Retention	.25

Only Situation III loads high on this factor as compared with the other variables. Situation III involves a recall of the exact details of overseas intelligence information. Likewise the next three variables loading on this factor also involve a good deal of attention to details. Conceivably, Situation III would involve some memory ability following an auditory presentation, so the presence of Auditory Retention on this factor gives some support to this interpretation. A person high on this factor apparently pays attention to details in the performance of superior speakers since he does not rate them as highly as do most people.

Factor K. Planning and Comprehension. The tests which have high loadings on this factor are as follows:

<u>Variable Number</u>	<u>Score</u>	<u>Factor Loading</u>
69	Sit. VIII. Plan. Inform. Paper	.75
70	Sit. IX. Written Exposition	.46
73	Sit. XII. Interview Listening	.36
10	Vocabulary	.35
74	Sit. XIII. Reading Compreh.	.33
47	Qual. of Super. Spkr.	.31
65	Sit. V. Emergent Leader	.28
14	Auditory Retention	.28
9	Plot Titles--clever	-.25
22	Revision II--words/ideas	-.24
67	Sit. VI. Desig. Leader--status	.23
8	Plot Titles--non-clever	.23

Most of the variables which loaded on this factor seem to involve a comprehension of verbal materials, especially in the situational tests. Comprehension of various types would be important to high performance in most of the tests loading on this factor, including listening comprehension, reading comprehension, word comprehension, and insight about a specific audience. Planning and writing effectively without being too wordy, clever, or abstruse for the available audience is also important in this factor.



Persons performing well on this factor showed some status-seeking tendencies in their oral communications in the Designated Leadership situational test and tended to emerge somewhat as leaders in an unstructured leaderless situation.

Factor L. Idea Extraction and Thinking Abilities. The tests which have high loadings on this factor are as follows:

<u>Variable Number</u>	<u>Score</u>	<u>Factor Loading</u>
84	Sit. XVII. Written Interp.--idea	.75
67	Sit. VI. Desig. Leader--status	.44
9	Plot Titles--clever	.37
58	Sit. I. Conference	.33
65	Sit. V. Emergent Leader	-.32
38	Brick Uses--total	-.31
14	Auditory Retention	-.31
45	Soc. Instit.--indirect	.31
62	Sit. III. Lecture--speak	.29
41	Test of Insight--Affil.	.27
53	Outlining III	.23
80	Writing Organization	.22
81	Speaking Organization	.22

The person with a high loading on this factor tends to be a thorough, quiet, and organized thinker who is good as an idea finder when reading, though perhaps somewhat preoccupied and slightly below average when listening. He is an effective message extractor and re-writer so that the ideas are transmitted in an interesting fashion. His contribution in a conference is probably positive because of his thinking ability and cleverness of expression, though he may tend to be quiet and below average in fluency with some need for affiliation and a need to let his workers know who is boss. His messages tend to be well organized, whether expressed orally or in writing.

Factor M. Organizing Ability. The tests with high loadings on this factor are as follows:

<u>Variable Number</u>	<u>Score</u>	<u>Factor Loading</u>
81	Speaking Organization	.78
68	Sit. VII. Emergency Telephone	.76
58	Sit. I. Conference	.66
65	Sit. V. Emergent Leader	.48
37	Brick Uses--categ. chgs.	.47
86	Rate of Public Speaking	.44
53	Outlining III	.44

<u>Variable Number</u>	<u>Score</u>	<u>Factor Loading</u>
62	Sit. III. Lecture--speaking	.36
77	Sit. XVI. Adm. Discip. Action	.36
52	Skimming Exercise	.29
22	Revision II--words/idea	-.28
84	Sit. XVII. Written Interp.--idea	.24
80	Writing Organization	.24
3	Satis. Ability--read	.24
87	Seconds Pauses/minute speaking	-.22
47	Qual. of Super. Spkr.	-.22
26	All-Round Ability--write	.22

Most of the variables loaded on this factor seem to involve some kind of organizing ability pertaining to communications messages. In addition to Speaking Organization, the next highest loadings were situational tests in which the organization of materials and the organization of oneself, too, in the Emergency Telephone situation seem to be important features in dealing effectively with these situations. The opposite end of this factor perhaps could well be called "disorganization." However, the term disorganization often carries the connotation of anxiety or frustration which is not implied by this factor, but merely not having spent the effort or not having much capability of being well organized. There is more emphasis in oral than written communication so this is almost a factor of organization, especially in oral communications. Those below average on this factor are wordy, have more than an average total time in pauses in their speaking, and have an exaggerated estimate of the qualities of a superior speaker.

This organizing ability has some pertinence to creativity as well as to the communication area. For example, Barron (1963) discusses this problem in his chapter entitled "The Needs for Order and Disorder as Motives in Creative Abilities." Creative individuals tend not to accept the present order or organization of things in their area of most creative efforts. Instead they are willing to live with greater disorder for a long period of time, if necessary, while they struggle with their own mind and energies to discover or create a better organization than that which is currently accepted. They resist premature organizing in order eventually to bring about a better order or organization of their own making.

Factor N. Revision Ability. The tests which have high loadings on this factor are as follows:

<u>Variable Number</u>	<u>Score</u>	<u>Factor Loading</u>
21	Revision II--words	.86
20	Revision II--ideas	.74
76	Sit. XV. Editing	.45
54	Biog. Info.--speak	-.32
75	Sit. XIV. Writing I	.30
10	Vocabulary	.25
85	Rate of Oral Reading	.25
42	Test of Insight--status	-.22
16	Telegram III--words	-.22
11	Topics--quantity	.22

The three highest loadings on this factor are for revision and editing scores, so that it seems to involve revision and editing ability, i.e., efficiency in the reduction and compactness of written expression with some resistance to the reduction in the number of ideas. An above average vocabulary and some writing ability and fluency of ideas are also involved, as is a somewhat fast rate of oral reading (though his biographical pattern describes him as below average in speaking ability) together with a below average need for status.

Factor O. Concentration and Efficiency in Dealing with Messages.  
The tests which have high loadings on this factor are as follows:

<u>Variable Number</u>	<u>Score</u>	<u>Factor Loading</u>
61	Sit. III. Lecture--ideas/oral	.80
60	Sit. III. Lecture--ideas/notes	.72
87	Seconds Pauses/minute speaking	-.66
74	Sit. XIII. Reading Compreh.	.45
53	Outlining III	.44
86	Rate of Public Speaking	.40
85	Rate of Oral Reading	.37
40	Phrase Check List--neg.	-.35
22	Revision II--words/idea	-.30
10	Vocabulary	.29
78	Sit. XVIII. Writing II	.28
62	Sit. III. Lecture--speaking	.27
42	Test of Insight--status	.25
75	Sit. XIV. Writing I	.23
20	Revision II--ideas	.23
6	Verbal Classification	.23
76	Sit. XV. Writing I	.23
27	All-Round Ability--read	.22
52	Skimming	.22

It seems that many scores above involve some degree of an ability to concentrate on ideas and meanings. The factor is also concerned with efficiency in dealing with messages. This includes the ability to extract and get the essence of the message from the printed page in such activities as Outlining, Skimming, Revision II, and Reading Comprehension as well as in the listening and note-taking part of Situation III. It also deals with effective processing and expressing of this message, including a smooth, easy flow of talking or speaking as well as writing, good vocabulary tools of expression, and good editing and revision skills. Persons high on this factor have some slight status needs and a below average number of negative speaking attributes. They are also capable of effective and compact expression of the message. This is one of the clearest factors to interpret since almost everything appearing on it is consistent as an entire picture. Fortunately, too, and somewhat unique in comparison with several other factors, all the attributes that emerge positively are commendable ones.

Factor P. Quality of Verbal Expression. The tests with high loadings on this factor are as follows:

<u>Variable Number</u>	<u>Score</u>	<u>Factor Loading</u>
23	Similes I--% high	.88
24	Similes I--high	.86
50	PE Scale--anxiety	-.36
42	Test of Insight--status	-.24
45	Soc. Instit.--indirect	.23
52	Skimming	.22

The two highest loadings on this factor (Similes I--% High Quality and Total High Quality) are exceptionally high compared to the loadings of the other variables. For this reason the factor has been identified with the main characteristic of these variables. The ability to create fresh similes, especially of high quality, and the effective use of similes in one's discourses seems to be an important feature in the ability to perform at a high quality level in verbal expression. Tendencies to be anxious and to seek status seems to work against this quality-of-expression ability.

Factor Q. Command Supervisory Ability. The tests which have high loadings on this factor are as follows:

<u>Variable Number</u>	<u>Score</u>	<u>Factor Loading</u>
66	Sit. VI. Desig. Leader--total	.85
73	Sit. XII. Interview Listening	-.38
42	Test of Insight--status	.26

<u>Variable Number</u>	<u>Score</u>	<u>Factor Loading</u>
77	Sit. XVI. Adm. Discip. Action	.26
78	Sit. XVIII. Writing II	.22
52	Skimming	-.22

As with several other factors, one variable loads exceptionally high on this factor, while others are relatively low. This situation requires the examinee to oversee a work detail and given oral directions and immediate supervision to this team of workers. He was scored for several supervisory skills which results in a composite score rather than separate scores. He likewise was functioning in a supervisory role in the Disciplinary Action situation, another interpersonal communication situation, and showed a need for status, possibly supervisory status, in a predictor test. This factor may be most concerned with Supervisory Skills, especially oral expression in a direct person-to-person command situation. While he was above average in one of the longer writing tasks, it is unfortunate that he is below average in a skimming task, hopefully a valuable and efficient supervisory skill, and in a listening task, also a potentially most valuable supervisory skill wherever good two-way communication is really desired.

Factor R. Excessive Focus on Oral Presentations. The tests which have high loadings on this factor are as follows:

<u>Variable Number</u>	<u>Score</u>	<u>Factor Loading</u>
64	Sit. IV. Instruct. On-the-Job	.74
72	Sit. XI. Identification of Sounds	-.74
85	Rate of Oral Reading	.39
59	Sit. II. Oral Reading	.37
47	Qual. of Super. Spkr.	.29
30	Diff. Score--write	.29
71	Sit. X. Control Tower Listening	-.26
86	Rate of Public Speaking	.25
36	Word Association--qual. var.	.25
29	Diff. Score--speak	.24
1	Satis. Ability--speak	.23
8	Plot Titles--non-clever	.22
41	Test of Insight--affil.	.22

This factor is difficult to interpret in view of the high positive loading of Situation IV, the equally high negative loading of Situation XI, and the smaller negative loading of Situation X. The latter two Situational Tests involve listening and identifying meaning in sounds or meaning in messages in spite of background noises, while most of the other tests involve output through



speaking. The tests with the highest loadings, with the one exception of the negatively loaded listening situational score, involve presenting material orally. One might think of this as an extreme focus on successful output and expression, especially oral expression, with so much emphasis that input processes suffer since he is an inaccurate listener. It appears that the person high on this factor is somewhat of a "fast talker" and wants to tell, not listen, and express, not receive information and ideas effectively. His aspirations are high especially in public speaking and he has a high concept of what a superior speaker is like, so high that he is striving hard to grow and attain a high minimum level of aspiration in speaking. The need for affiliation score from the Test of Insight could be interpreted here as representing a need for listeners rather than for companions, a need for an audience rather than for two-way communication. In the instructing situation on the job he performed well in front of the captive audience, a position which he cherished. In addition he knew about something that apparently the other two in the situation did not know so he had a chance to tell them and to easily dominate the session.

Factor S. Social Awareness. The tests which have high loadings on this factor are as follows:

<u>Variable Number</u>	<u>Score</u>	<u>Factor Loading</u>
46	The Empathy Test	.75
51	PE Scale--lie	.65
41	Test of Insight--affil.	.40
32	Diff. Score--listen	.30
87	Seconds Pauses/minute speaking	-.30
52	Skimming	-.25
4	Satis. Ability--listen	.22

Nearly all of the variables loading on this factor, especially the three with the highest loadings, seem to indicate an awareness of social conventions and need to be very acceptable socially to the degree of exaggeration (or even faking) his own characteristics. He shows an above average motivation toward listening and "tuning in" to others. Even the variables concerned with listening and speaking would seem to involve his characteristic of social awareness, although to a lesser degree.

Factor T. Achievement Motivation. The tests which have high loadings on this factor are as follows:

<u>Variable Number</u>	<u>Score</u>	<u>Factor Loading</u>
43	Test of Insight--achiev. mot.	.78
16	Telegram III--words	.35
74	Sit. XIII. Reading Compreh.	.32
45	Soc. Instit.--indirect	.13
75	Sit. XIV. Writing I	.27
10	Vocabulary	.26
83	Sit. XVII. Written Interp.--distortion	-.26
80	Writing Organization	.24
15	Telegram III--ideas	.23

In view of the high loading of the one variable on this factor and the varied characteristics of the other variables which loaded relatively low, this factor was named Achievement Motivation for the first variable. Insofar as the person's projections on this test are valid, this seems to be the nature of this factor, considering also that the subjects have been students essentially most of their lives and their achievement goals tend to be along the highly verbal academic lines. Other descriptions are that a person with a strong achievement motive retains more ideas and also uses the maximum number of words allowed in writing a telegram, has built up a good vocabulary, reading comprehension ability, and writing ability, and is quite accurate in transmitting given messages in a public speaking situation without making additions or other distortions of his own.

Factor U. Minimum Aspiration Level in Communication Abilities. The tests with high loadings on this factor are as follows:

<u>Variable Number</u>	<u>Score</u>	<u>Factor Loading</u>
2	Satis. Ability--write	.82
4	Satis. Ability--listen	.82
1	Satis. Ability--speak	.80
3	Satis. Ability--read	.75
78	Sit. XVIII. Writing II	.55
80	Writing Organization	.50
29	Diff. Score--speak	.48
75	Sit. XIV. Writing I	.47
71	Sit. X. Control Tower Listening	.45
26	All-Round Ability--write	.45
10	Vocabulary	.41
32	Diff. Score--listen	.38
27	All-Round Ability--read	.34
69	Sit. VIII. Plan. Inform. Paper	.32
31	Diff. Score--read	.32
22	Revision II--words/idea	-.31

<u>Variable Number</u>	<u>Score</u>	<u>Factor Loading</u>
28	All-Round Ability--listen	.31
59	Sit. II. Oral Reading	.28
5	First and Last Letters	.28
20	Revision II--ideas	.28
25	All-Round Ability--speak	.27
8	Plot Titles--non-clever	-.26
33	Word Association--total	.26
70	Sit. IX. Written Exposition	.24
34	Word Association--unpop.	.24
60	Sit. III. Lecture--idea/notes	.23
40	Phrase Check List--neg.	-.23
74	Sit. XIII. Reading Compreh.	.22

This factor seems to be an aspiration factor, since the four variables that loaded highest are the Satisfactory Ability scores in writing (.82), listening (.82), speaking (.80), and reading (.75). The Satisfactory Ability scores reflect minimum acceptable level with which an individual states he would be satisfied to possess. Self-ratings on the four communication channels and the corresponding Difference Scores (Satisfactory Ability scores minus All-Round Ability scores) which is a self-estimate of the individuals present abilities also loaded relatively high on this factor. It is not surprising to see several other variables loaded on this factor, since Satisfactory Ability ratings were correlated significantly with All-Round Ability ratings, which, in a sense, reflect achievement. One might expect aspiration to be related in some way to achievement.

Factor V. Aspiration to Grow in Communication Abilities. The tests with high loadings on this factor are as follows:

<u>Variable Number</u>	<u>Score</u>	<u>Factor Loading</u>
28	All-Round Ability--listen	-.81
31	Diff. Score--read	.78
27	All-Round Ability--read	-.73
32	Diff. Score--listen	.73
30	Diff. Score--write	.49
25	All-Round Ability--speak	-.37
26	All-Round Ability--write	-.35
29	Diff. Score--speak	.33
10	Vocabulary	-.30
11	Topics--quantity	-.28

On this factor all four Difference Scores have the four highest positive loadings (.33 to .78) and all four All-Round Ability ratings have the four highest negative loadings (-.35 to -.81). It

would seem reasonable that there should be this inverse relationship inasmuch as the Difference Score is the minimum acceptable level minus the All-Round Ability ratings, so the higher the All-Round Ability, the lower the Difference score--and vice versa. The other scores on this factor indicate that the better vocabulary, the less aspiration (or feeling of a need) to grow in communication abilities. Likewise, the greater number of subtopics one can list on which he could write a paragraph in a theme on a given topic, the less he has an aspiration to grow in communication abilities.

Factor W. Biographical Indicators of Reading and Writing Abilities.  
The tests which have high loadings on this factor are as follows:

<u>Variable Number</u>	<u>Score</u>	<u>Factor Loading</u>
55	Biog. Info.--write	.82
56	Biog. Info.--read	.67
26	All-Round Ability--write	.42
77	Sit. XVI. Adm. Discip. Action	.42
16	Telegram III--words	.39
30	Diff. Score--write	-.36
54	Biog. Info.--speak	.35
59	Sit. II--Oral Reading	.31
3	Satis.Ability--read	.28
57	Biog. Info.--listen	.25
65	Sit.V.--Emergent Leader	-.23

This factor seems to be complementary to Factor X. The variables with the highest loadings are the biographical scores on writing and reading. In fact, all four biographical scores on writing, reading, speaking, and listening emerged positively on this factor. These variables and several others seem to indicate a general good background of experience in the communication skills, especially in reading and writing. The person's current writing ability is fairly near to his aspiration level, but he has high aspirations in reading. He also rates himself above average in writing and slightly so in speaking. His capabilities in writing are such that he tends to use the maximum words allowable in composing a telegram. He also functions with some efficiency in oral reading and in a person-to-person disciplinary action situation.

Factor X. Biographical Indicators of Oral Communication Abilities.  
The tests with high loadings on this factor are as follows:

<u>Variable Number</u>	<u>Score</u>	<u>Factor Loading</u>
57	Biog. Info.--listen	.69
83	Sit. XVII. Written Interp.--distort	-.57
54	Biog. Info.--speak	.57
50	PE Scale--anxiety	-.53
56	Biog. Info.--read	.35
51	PE Scale--lie	.34
53	Outlining III	.33
76	Sit. XV. Editing	.32
42	Test of Insight--status	.28
22	Revision II--words/ideas	-.26
40	Phrase Check List--neg.	-.22

Three of the highest positive loadings are biographical scores, the two highest being listening and speaking (with the reading score also appearing slightly on this factor). The biographical items represent an individual's report of his experiences in life in which communication activities were assumed to be present. Other scales of a self-descriptive nature which loaded on this factor were the P.E. Anxiety and Lie scores. This factor shows that persons who score low on the biographical scores on listening and speaking are anxious persons who tend to add to and otherwise distort their messages in communication situations. High scorers on this factor are effective communicators in that they can receive and transmit messages without distortion, and are efficient in their use of words in expressing ideas. But they do have some status seeking tendencies and some of them are likely to exaggerate their own self-descriptions on typical personality type tests.

Factor Y. Self Rating on Speaking Abilities. The tests which have high loadings on this factor are as follows:

<u>Variable Number</u>	<u>Score</u>	<u>Factor Loading</u>
39	Phrase Check List--pos.	.82
40	Phrase Check List--neg.	-.67
25	All-Round Ability--speak	.64
29	Diff. Score--speak	-.43
62	Sit. III. Lecture--speaking	.42
59	Sit. II. Oral Reading	.37
16	Telegram III--words	-.37
54	Biog. Info.--speak	.32
45	Soc. Instit.--indirect	.32
14	Auditory Retention	.30
15	Telegram III--ideas	-.29
22	Revision II--words/ideas	-.27
67	Sit. VI. Desig. Leader--status	.25



<u>Variable Number</u>	<u>Score</u>	<u>Factor Loading</u>
85	Rate of Oral Reading	.25
1	Satis. Ability--speaking	.23
47	Qual. of Super. Spkr.	.23
50	PE Scale--anxiety	-.23

All of the highest loadings, as well as several of the others, are on variables involving speaking or oral communication. Variables with the highest loadings are also of the self-report type from inventories dealing with this mode of communication. This is notably true of the two Phrase Check List variables and All-Round Speaking Ability. There is some soundness for the person's high self-rating on speaking ability as evidenced by the two main situational scores on speaking ability having moderate loadings on this factor. He is also above average in listening comprehension. The person gave status seeking comments in another situation although he is not an anxious person. He was not wordy in a telegram writing test nor in a revision test.

#### Summary and Discussion of the Battery C Factors

In general, the factors in Battery C where both predictors and criteria were factored together are more complex, yet more intriguing, than where only the predictors were involved, as in Batteries A and B and in other typical studies. This is especially true of those factors in Battery C having several criterion scores on them.

The list of all 25 factors in Battery C is given below. The 10 factors marked with an asterisk (\*) were found before in Battery A and/or in Battery B exactly as described here or in some cases sufficiently similar to be crudely called approximately the same factor. The battery or batteries in which a factor was found are indicated in parentheses following the factor name. Only Ideational Fluency clearly and unquestionably emerged in all three factor studies.

Factor A	*Ideational Fluency (Batteries A, B, and C)
" B	*Associational Fluency (A,C)
" C	*Word Fluency (A,C)
" D	*Expressional Fluency (A,C)
" E	*Flexibility (A,C)
" F	*Wordiness of Expression (B,C)
" G	*Tendency to Produce Superficial Ideas (B,C)
" H	Speech Sound Discrimination (C)
" I	Distortion Tendencies (C)
" J	Attention to Detail (C)

- Factor K Planning and Comprehension (C)
- " L Idea Extraction and Thinking Abilities (C)
- " M Organizing Ability (C)
- " N Revision Ability (C)
- " O Concentration and Efficiency in Dealing with Messages (C)
- " P Quality of Verbal Expression (C)
- " Q Command Supervisory Ability (C)
- " R Excessive Focus on Oral Presentations (C)
- " S \*Social Awareness (B,C)
- " T Achievement Motivation (C)
- " U \*Minimum Aspiration Level in Communication Abilities (B,C)
- " V Aspiration to Grow in Communication Abilities (C)
- " W Biographical Indicators of Reading and Writing Abilities (C)
- " X Biographical Indicators of Oral Communication Abilities (C)
- " Y \*Self Rating on Speaking Abilities (B,C)

The list of factors has also been rearranged below to display which were the most "popular" factors, that is, those, with loadings in the greatest number of scores in the battery. For example, Factor U at the top of the list on Minimum Aspiration Level in Communication Abilities had 28 of the 87 scores appearing on it, whereas Factor I on Distortion Tendencies had only 4 scores on it because there was comparatively little emphasis and attention paid to distortion and error scores when the total battery was constructed and assembled.

Minimum Aspiration Level in Communication Abilities (28)	Tendency to Produce Superficial Ideas (10)
Associational Fluency (21)	Revision Ability (10)
Concentration and Efficiency in Dealing with Messages (19)	Aspiration to Grow in Communication Abilities (10)
Word Fluency (17)	Achievement Motivation (9)
Organizing Ability (17)	Wordiness of Expression (8)
Self Rating on Speaking Abilities (17)	Flexibility (7)
Ideational Fluency (16)	Speech Sound Discrimination (7)
Idea Extraction and Thinking Abilities (13)	Attention to Detail (7)
Excessive Focus on Oral Presentations (13)	Social Awareness (7)
Planning and Comprehension (12)	Quality of Verbal Expression (6)
Expressional Fluency (11)	Command Supervisory Ability (6)
Biographical Indicators of Reading and Writing Abilities (11)	Distortion Tendencies (4)
Biographical Indicators of Oral Communication Abilities (11)	

In comparing the ratio of predictor to criterion scores per factor, the 25 factors varied widely as to whether they contained more predictors/criteria or less predictors/criteria than would be expected by chance. The former were predominantly predictor factors and the latter factors had more emphasis on criterion scores. The factors have been rearranged in sequence below, with the first ones in the left hand column being more criterion oriented and the last ones at the bottom of the right hand column being more predictor oriented. Most, but not all, of the landmark factors are near the bottom of this list, indicating that landmark factor studies have almost predominantly been conducted on predictor scores only, covering some of the types of tasks in our criterion situational tests. All of the 25 factors contain both criterion and predictor scores except for the last 3 which only include predictor scores.

Command Supervisory Ability	Biographical Indicators of Reading
Idea Extraction and Thinking	and Writing Abilities
Abilities	Distortion Tendencies
Planning and Comprehension	Wordiness of Expression
Organizing Ability	Revision Ability
Achievement Motivation	Biographical Indicators of Oral
Attention to Detail	Communication Abilities
Associational Fluency	Expressional Fluency
Concentration and Efficiency	Self Rating on Speaking Abilities
in Dealing with Messages	Ideational Fluency
Minimum Aspiration Level in	Tendency to Produce Superficial
Communication Abilities	Ideas
Excessive Focus on Oral	Quality of Verbal Expression
Presentations	Social Awareness
Word Fluency	Aspiration to Grow in Communication
Speech Sound Discrimination	Abilities
Flexibility	

A subjective analysis of the 25 factors indicates that 7 of them called for expanding or diverging thinking and expression whereas 6 of them requested a reduction or extraction of materials to be expressed, that is, a "boiling down" process of communication. Predictor and criterion scores were spread across these two broad types of factors equally, that is, in about the same proportion as they appeared in the battery.

All of the scores in Battery C were analyzed in terms of their factorial complexity. In this crude analysis the number of factor loadings that were .22 or higher (in absolute value) were counted. The median for the 87 scores was approximately 3.5 such factor loadings out of a possible 25.

Somewhat unexpectedly, it was found that the predictors tended to have slightly more loadings above .22 across the 25 factors than did the criterion scores. From this perspective, the predictor scores would appear to be more complex factorially than the criterion scores. However, this conclusion is tentative and might be modified in light of the particular set of scores assembled in this study which determines the number and type of factors that emerge. Perhaps more factors emerged which tended to be the type on which these predictors rather than these criteria would appear. In other words, this outcome is dependent upon the constitution of the particular battery of scores.

Or it may be that the predictor scores were generally of higher reliability, giving them a higher ceiling of variance; in other words, a score with a greater amount of reliable variance would have a greater chance to have a noticeable portion of this variance appear in each of several common factors. A check on the communalities shows that the distributions overlap considerably for predictor and for criterion scores, but that the predictor scores on the average have lower communalities (a median of .81) than do the criterion scores (a median of .84), which argues slightly against the above explanation.

The two scores which appeared on the most factors (on 8 of the 25 factors) were the Auditory Retention score and the number of words used in the Telegram Writing III test. The 5 scores of a factorial complexity of 7 out of 25 were also all predictors as follows: the quantity score on Topics, the ratio of words/idea on Revision II, the indirect score on Social Institutions, the Qualities of a Superior Speaker score, and the Skimming score.

Somewhat surprisingly the Vocabulary test score was one of the 7 scores that loaded on 6 factors, so that it appears to be one of the factorially most complex scores in the study. The Vocabulary score appeared on the following factors: Minimum Aspiration Level in Communication Abilities, Planning and Comprehension, Aspiration to Grow in Communication Abilities (a negative loading), Concentration and Efficiency in Dealing with Messages, Achievement Motivation, and Revision Ability. The results here are contrary to the type of findings in previous factorial studies in which Vocabulary has been almost a pure, high loading measure of the Verbal Comprehension factor with few if any loadings on other factors. But in all three batteries in the present project, the Vocabulary test has been factorially complex, appearing on three, five, and six factors in the three factor studies of Batteries A, B, and C.

The ratio score on Revision II also warrants special attention because it had the greatest number of significant validities (18)

against the 27 criterion scores, as will be seen in Chapter X on the validities of predictors. This ratio score appeared on 7 factors, namely Minimum Aspiration in Communication Abilities, Word Fluency, Concentration and Efficiency in Dealing with Messages, Organizing Ability, Self-Rating on Speaking Abilities, Biographical Indicators of Oral Communication Abilities, and Planning and Comprehension.

In summary, 25 factors were described and interpreted for Battery C, which contained 60 predictor and 27 situational criterion scores of communication abilities. These factors have been listed according to whether or not they are landmark factors, whether they also appeared in Battery A or B, whether they appear in many or in only a few scores in the battery, and whether they tend to contain predominantly criterion or predictor scores or both. At least half of the factors were new ones with many intriguing features and usually involving several criterion scores.

The next chapter will show the results of intensive efforts on how the tests and the factors in Battery C fit into each of the four main channels of communication, together with analyses of the interrelations both within and between the four channels of communication.



## CHAPTER IX

### THE FOUR MAIN CHANNELS OF VERBAL COMMUNICATION

#### Two Analyses of the Battery C Factors According to Communication Channels

Several attempts were made to classify the 25 Battery C factors subjectively according to their titles. However, it was a difficult task to fit them readily into the four communication channels of reading, listening, speaking, and writing, or to find other appropriate categories. If a category of personality and/or self-report were used, six or more of the factors could readily fall into this category rather than into one of the four communication channels. Likewise, an attempt to classify the factors into only the four channels of communication, which include two input (receptive) and two output (expressive) channels, led to the need for a central processing category, into which many of the factors might partly or largely fall. Another one of the main problems was that most of the factors cut across two or more channels of communication and would also involve some central processing. This would even be true, to some degree, for the self-report and personality factors.

A crude breakdown into only receptive, central, and expressive categories was tried and proved to serve fairly well, but required at least one other category, a personality one, which could be described as motivational in nature. Most of the factors fell on the expressive side, as would be expected from the predominantly expressive types of scores in the battery. The second largest group of factors fell into the central processing category, with three factors being classified into each of the receptive and motivational categories. The list below shows this attempt to classify all of the factors into these four categories.

#### Motivational

Achievement Motivation  
Minimum Aspiration Level in Communication Abilities  
Aspiration to Grow in Communication Abilities

#### Receptive

Speech Sound Discrimination  
Attention to Detail  
Social Awareness

#### Expressive

Ideational Fluency  
Associational Fluency  
Word Fluency  
Expressional Fluency  
Flexibility  
Wordiness of Expression  
Tendency to Produce Superficial Ideas  
Quality of Verbal Expression  
Command Supervisory Ability

Central

Distortion Tendencies  
Planning and Comprehension  
Idea Extraction and Thinking  
Abilities  
Organizing Ability  
Revision Ability  
Concentration and Efficiency  
in Dealing with Messages

Expressive (Con't.)

Excessive Focus on Oral Presentations  
Biographical Indicators of Reading  
and Writing Abilities  
Biographical Indicators of Oral  
Communication Abilities  
Self Rating on Speaking Abilities

As another approach into this area, each of the 87 scores in Battery C was classified as following predominantly into 1 of these 4 main channels of communication. The surprising finding was that 17 of the 25 factors contained scores from every one of these 4 channels of communication. Seven factors contained scores from some combination of 3 of the 4 channels, and the remaining factor entitled Distortion Tendencies contained scores from only 2 channels of communication. This is a striking finding because there was no single factor which emerged clearly and solely as a single-channel-of-communication factor. The only two channels that were missing and had 0 scores on any of the factors were the reading and the listening channels. An absence of reading scores occurred on 4 factors and an absence of listening scores occurred on 5 factors, including the one factor of Distortion Tendencies which had neither reading nor listening scores on it.

When these scores for the 4 different channels of communication were analyzed within each factor, it was found that 14 of the factors had more writing scores than any other type. Eight of the factors had more speaking scores than any other type. Two factors had more reading scores than any one type, and one factor had more listening scores than any other type.

The relationships between four main channels of communication, namely, reading, listening, speaking, and writing, have been largely unknown heretofore as far as human talents are concerned and the results presented thus far in this report seem unclear on this matter. Likewise the relationships among all variables which tend to be characteristic of one channel are puzzling, so the entire area needs as much clarification as possible. There is some evidence of interrelationships among channels (Hildreth, 1954; Loban, 1963), but there are also indications of the lack of interrelationships (Martin, 1955). All of these studies were in language arts with elementary school children.

There are numerous studies, too, of the mechanics and the equipment in communication systems. The focus in the present study, however, is on the human abilities, the dimensions of communicating along which people show great individual differences. Some of these abilities have been the subject of a good deal of research, but with conflicting results. The main question is what are the variables (dimensions) in human abilities in communications? It would seem that the identification and study of these variables would help to clarify the understanding of conflicting results. Perhaps an examination of some results obtained here will help to clarify some of the problems.

#### Relationships of Variables Within the Four Communication Channels

The approach in this chapter is to examine the relationships among certain highly selected scores which presumably are more characteristic of one particular channel of communication than another. To accomplish this purpose, several scores in Battery C were carefully classified subjectively into the most pertinent one of the four communication channels of reading, listening, speaking, and writing. Inasmuch as our main concern was simply the relationships among variables, both the criterion and predictor scores were treated alike, ignoring this distinction between them for this particular purpose. The classification of each of the test and criterion scores primarily into one of the four channels was by no means a clear and simple task; however, efforts were made to make distinctions as uncontroversial as possible. In making the classification the element in the scoring were examined carefully to determine what the major components were. Next the probable "orientation" of the examinee in completing the exercise was considered. Perhaps some illustrations will clarify the methodology used.

If a score was based on grammar, interest, organization, sentence structure, etc., as in an exercise in written composition, it was classified as a writing variable. If a score was based on voice quality, choice of spoken words, demeanor, delivery, etc., in an oral exercise, it was classified as a speaking variable. Variable 59 involved the oral reading of complex instructions. The scoring, however, was based not on reading but rather on ratings of voice quality and manner of presentation, i.e., on such details as effective emphasis, pauses, use of gestures, and eye contact with the audience. These components were felt to be more characteristic of speaking variables, and thus the variable was so classified. Variable 15 may serve to illustrate the orientation aspect. The task was to write a telegram from a description of a given incident. It was felt that the attitude of the examinee in performing this task would probably be more like a writing set--a manipulation of

words on paper. The responses, of course, were scored for variables relevant to writing rather than to reading.

On the other hand such scores as Variable 18 (Letter-Star) were not classified into any category. This task required the examinee to construct short phrases in which some of the chosen words had to begin with the given letter (Letter), while other words could be chosen freely (Star). The restrictions were that the chosen words once used could not be used again, and that the phrase had to be meaningful. For example \*\*L could be "on the lake" or "this is living." Here it was difficult to determine whether this activity (which could theoretically be administered as a written or an oral test) was more characteristic of writing or of speaking (it may be equally characteristic of both), nor could the attitude or set of the individual be determined, although it was used here as a written exercise. The Verbal Classification task was another variable which could not be confidently or conveniently classified and was therefore discarded from further analysis for this particular purpose.

In this analysis only clearcut cases were retained including 11 speaking scores, 18 writing scores, 6 reading scores, and 5 listening scores. The intercorrelations of these variables, identified by their Battery C numbers, across pairs of the four channels, will be shown one at a time in Tables 24 to 34. The first four tables are within-channel tables such as speaking vs. speaking, writing vs. writing, etc., while the remaining six tables are across channels, such as speaking vs. writing. A summary of these results both among and between channels is presented toward the end of this chapter in Table 34.

Reading vs. Reading: Six scores were classified as reading scores, giving 15 intercorrelation coefficients. It can be seen from Table 24 that one correlation was exceptionally high ( $r = .70$ ) while the remainder were moderate to low. This one high correlation could be expected from experimental dependence across the particular pair of scores, since it represents the relationship between the number of ideas each subject wrote on a card and the number he presented in a lecture immediately afterwards, using this same card of notes. The source of these ideas, however, was briefing materials presented to the examinee; thus the second score represented a kind of recall of this briefing session, a recall under pressure of speaking to an audience, but with the help of the notes. This score was an indication of the speaker's ability both to store up information and to draw upon his internal resources and his reading of these notes in the process of delivering his speech.



Table 24\*

## CORRELATIONS AMONG SCORES WITHIN THE READING CHANNEL

<u>Reading Scores</u>		<u>Reading Scores</u>					
		52	53	60	61	74	85
Skimming	.52	--					
Outlining III	53	36	--				
Sit. III. Lecture--ideas/notes	60	13	28	--			
Sit. III. Lecture--ideas/oral	61	31	41	70	--		
Sit. XIII. Reading Compreh.	74	36	35	37	46	--	
Rate of Oral Reading	85	32	27	22	40	49	--

\*The decimals have been omitted for the correlation coefficients in all tables in this chapter.

The correlations among the reading variables show various relationships so that certainly more than one reading ability factor exists, but perhaps only a few factors might be involved. The number and kind of reading tasks used here were somewhat limited, and additional kinds of reading tasks are definitely needed to cover and explore the area more thoroughly. From the evidence in this study, reading appears to comprise fewer factors than other channels. However, with a wider variety of reading tasks and materials, this picture could change, even drastically. Perhaps measures of silent reading speed, speed reading, flexibility of reading speed, speed and accuracy of following complex instructions, retention of factual data vs. comprehension or understanding, reading for ideas including creative reading to spark oneself to new ideas, and proofreading might be used to study the reading area.

Even though most of the correlations were moderate or low, only one failed to reach the .05 level of significance. The magnitude of these correlations seems to indicate that the reading domain as measured by these few variables involves several somewhat separate, though related factors. This interpretation is based on observation of the paucity of either very high or very low correlations. Perhaps with a greater variety of reading variables, more extreme correlations and more dimensions of reading ability will emerge.

Listening vs. Listening: There were only five scores in which the characteristics of the tests seemed to be related mainly to listening. In general the low intercorrelations shown in Table 25



tend to indicate the relative independence of these measures from each other and therefore the complexity of the listening domain. There is relatively little overlap among the variables in the listening category, with only 4 of the 10 correlations being significant and then usually only barely so. A close look at the kinds of tasks indicates that they are indeed quite different tasks. For example, it is doubtful that the ability to identify the source of various sounds (e.g., sounds of machines, animals) has much to do with listening comprehension or even with discrimination of verbal speech sounds, provided of course, the subject can, in fact, hear. But different individuals definitely excelled and different individuals got the lowest scores across these five listening tasks.

Table 25

CORRELATIONS AMONG SCORES WITHIN THE LISTENING CHANNEL

<u>Listening Scores</u>	<u>Listening Scores</u>				
	13	14	71	72	73
Spch. Snd. Discrim.	13	--			
Auditory Retention	14	31	--		
Sit. X. Control Tower Listening	71	22	05	--	
Sit. XI. Identification of Sounds	72	17	25	25	--
Sit. XII. Interview Listening	73	05	17	10	13

The two tasks which both purportedly measured auditory retention were not highly related. In Variable 73, a situation of listening to a recorded interview, the subject heard a conversation between an employer and a job applicant, and then answered orally-presented, factual questions on the content of the interview. In Variable 14, the subject listened to a recorded lecture and then answered factual questions, also presented orally by recording, about the lecture material. The correlation coefficient between scores on these two tasks was only .17. This unexpected finding raised our curiosity about the relationships between these two listening variables and Variable 74, a reading comprehension task. The correlations of Variable 74 with Variable 73 was .21, and with Variable 14 was .31, indicating only a small amount of overlap of somewhat similar comprehension tasks across channels of communication. And the puzzling finding is that two listening comprehension scores were less related than were the scores in a listening comprehension test and in a reading comprehension test.

In Variable 71, the examinee was to listen to an actual recording of airport control tower communications, a very difficult listening-through-noise task, and to write down everything he could hear and identify. Variable 13 simply called for the identification of that one of two printed words which was heard on a recording. These tasks appear to be somewhat similar in that the content of control tower communication is sometimes abbreviated sufficiently so that anticipation of "filling in" correct words is not always possible, as it could be in conversations. Yet the correlation between these two variables is only .22. Perhaps there are other features such as auditory interference, familiarity, and context which may account for the great differences rather than similarities.

In view of the fact that there are only five listening variables, perhaps it is premature to speculate on so little data. Nonetheless the implications from these data are similar to those in the other categories of great complexity and independence and perhaps lend themselves to some of the same types of interpretations.

Overall, it is surprising to find that even the two variables of the "listening retention" type failed to correlate significantly and two variables of the "auditory acuity" type also correlated barely at the borderline of significance. This raises the question as to the extent to which these few tests that were used here have covered the area of listening. For example, in transcription work we have found great individual differences in our own staff in a task we have called prooflistening. Does this prooflistening activity call for different listening abilities than those we have tested in this project? How many dimensions are involved in listening and what are they? What are the factors that affect listening? This is a tremendously important communication channel about which we know so little in terms of individual differences and dimensions of talents involved across all listening activities.

Speaking vs. Speaking: Eleven scores were classified as speaking or talking variables, yielding a total of 55 correlation coefficients among these talking scores, as seen in Table 26. Slightly over half of these are significant beyond the .05 level ( $p < .05 = .22$ ). The profile of the correlations with Variable 36 (Rate of Public Speaking) tended to include many of the high correlations. The fact that almost half of the correlations are not significant indicates some degree of independence among the talking variables. It can be seen that Variables 64 through 67 from the Instruction On-the-Job, Emergent Leader, and Designated Leader Situations account for nearly all but two of the 30 nonsignificant correlations. More will be said later about this and other unusual findings, after the correlations for the other channels have also been examined.

On the surface one might assume considerable similarity or overlap among certain speaking variables, yet the correlations did not seem to support this. In fact, some of the speaking variables which seemed to be least similar were often more highly correlated. Variables 64, 65, 66, and 67 were derived from three situational tests which, individually seemed to be psychologically similar in many ways to the other tests in the speaking class. Yet only one of their correlations with the other variables and among themselves was over .30. For example, a person's effectiveness of delivery score of speaking ability was essentially unrelated to the addition, distortion, and errors in his message and only slightly related (.27) to the number of the given ideas he delivered. The picture is almost that as people listen to speeches, they should remember the old saying "let the buyer beware," for they may become enamoured with the delivery so much that they buy the message, though the quality of the two may be almost unrelated.

A different picture emerged for the Speaking Organization score which was a composite score derived from the organization sections of three situational tests: namely, the Conference, the Classroom lecture, and the Emergency Telephone situation. Partly due to experimental dependence, Speaking Organization was highly correlated with performances in each of these three situations from which the Speaking Organization score was derived.

A careful study of the elements in the scoring shows that for the speaking scores 58, 59, 62, 68, and 77, most of the emphasis was on voice quality, overt behavior, and demeanor of the individual, e.g., articulation, gestures, and composure. The elements in scores 64, 65, 66, and 67 revolved mainly around effective job-performance types of behavior, such as the subject's ability to make suggestions, motivate the group, and explain carefully. These latter variables seemed to be scored more for the content and finesse in the formulation of the message rather than on the quality of the public speaking performance. If this interpretation is valid, then perhaps it could be said that the way a person expresses himself has little to do with his formulation of the message itself; i.e., a person who can present material well may not know what to present and when to present it in a face to face speaking situation, or one who knows what to communicate may not be capable of stating and expressing it in the most appropriate manner.

Writing vs. Writing: Eighteen scores were classified as being primarily relevant to writing tasks. Table 27 shows the 153 inter-correlations among these scores.

Table 26  
CORRELATIONS AMONG SCORES WITHIN THE SPEAKING CHANNEL.

	<u>Speaking Scores</u>										
	58	59	62	64	65	66	67	68	77	86	87
Sit. I. Conference	--										
Sit. II. Oral Reading	17	--									
Sit. III. Lecture--speaking	39	56	--								
Sit. IV. Instruct. On-the-Job	25	28	17	--							
Sit. V. Emergent Leader	38	-06	02	11	--						
Sit. VI. Desig. Leader--total	25	21	29	06	15	--					
Sit. VI. Desig. Leader--status	09	05	27	10	-01	-07	--				
Sit. VII. Emergency Telephone	31	35	36	08	27	01	07	--			
Sit. XVI. Adm. Discip. Action	31	30	32	24	10	29	-08	25	--		
Rate of Public Speaking	45	38	43	14	11	21	-03	34	33	--	
Seconds Fausces/minute speaking	-23	-34	-45	-02	07	04	-09	-22	-07	-65	--

Table 27

CORRELATIONS AMONG SCORES WITHIN THE WRITING CHANNEL

	<u>Writing Scores</u>															
	7	11	15	16	17	20	21	22	23	24	26	29	30	31	32	34
Similes I--total	--															
Topics--Quantity	37	--														
Telegram III--ideas	15	-15-10	--													
Telegram III--words	16	-04-18	42	--												
Telegram III--words/idea	17	12	02-60	30	--											
Revision II--ideas	20	19	38-06	-19-03	--											
Revision II--words	21	03	17	01-04	-07	77	--									
Revision II--words/idea	22	-30-39	09	24-05	-50	13	--									
Similes I--% high	23	-22	15	10	09-07	20	20-10	--								
Similes I--high	24	19	27	04	09-03	21	18-18	87	--							
Sit. VIII. Plan. Inform. Paper	69	22	29	17-08	-20	39	22-38	22	26	--						
Sit. IX. Written Exposition	70	17	24	13	06-13	16-04	-30	12	17	38	--					
Sit. XIV. Writing I	75	28	31-17	-21	07	54	22-56	10	17	37	43	--				
Sit. XV. Editing	76	19	27-21	-28	04	49	23-45	-04	02	27	17	50	--			
Sit. XVIII. Writing II	78	15	16-09	-14	01	37	10-46	27	29	33	43	55	22	--		
Sit. XVII. Written Interp.--interest	82	-15	11-07	-08-05	16	04-21	18	13	14	13	20	11	34	--		
Sit. XVII. Written Interp.--distort	83	28	13-18	-08	08-03	-01	02	03	13	17	15-02	-24	08	04	--	
Sit. XVII. Written Interp.--idea	84	16	13-03	-15-08	24	12-25	08	10	00	07	21	16	19	16	08	--



The writing scores also present a very complicated picture. In the first place, most of the 153 correlations are not significant and there is only a handful over .40. An examination of the writing scores showed that three different sets of scores were each derived from three separate tasks. Three scores were from the same situational test which involves rewriting a written directive, another three scores were all from a test involving similes, and a third set of three scores from a telegram writing task. The correlations show that these nine scores are almost totally unrelated to the other writing scores, and even within themselves there was a good deal of independence. In fact, a glance at the correlations with all other variables in the study reveals that each of these scores is largely unrelated to any of the 86 other scores in Battery C. This is indeed very puzzling and very difficult to interpret. Are each of these writing tasks so specific with little or no spread of relationships to other writing tasks?

A close examination shows that half of the ten highest correlation coefficients were with the Writing I score which was a complex writing situation task in which a composite score was derived from five areas of writing ability. Writing II was from a writing task that was scored identically. These two thus appear virtually parallel. Yet the correlation between these complex writing scores was only .55. A comparison of the profile of correlations of these two scores with the other score showed that those with score 75 are much like those with score 78. Score 70 came from still another writing task of a similar nature which was scored in much the same manner. Although it correlated fairly high (.43) with scores 75 and 78, its profile of correlations with the other scores in the battery is quite unlike the profiles of scores 75 and 78. This poses the question of the similarity of factors involved in these three writing tasks.

Several writing scores correlated significantly with other writing scores. On the other hand, an almost equal number had only two or three significant correlates. Of the 153 correlations, only about a third are significant. These data seem to support the contention that writing ability is a tremendously complex phenomenon, involving several unrelated factors. So in general, two writing tasks do not call for identical writing abilities. There is little evidence to support the notion of a general writing ability. More simply, this means that a good writer in one task is not necessarily a good writer in every other writing task. This conclusion is in harmony with the judgments of literary critics. Dreiser's style is notoriously inferior to his understanding of life, for example. Thomas Wolfe's mastery of languages far exceeded his control of narrative structure.

In summary, the data within channels present a very complex, if not a confusing, picture. In spite of the fact that all of these correlations above were within each of the communication categories, about 2/3rds of the coefficients were not significant (less than .22 in absolute value) and 9/10ths of them were less than .30. The largest proportion of significant correlations appeared among the reading scores. Perhaps the reading domain is less complex than the others, but such a speculation is made with caution since only six reading variables were examined. In any event, the number of low correlations tends to indicate a good deal of independence among the various measures within each channel of communication and to suggest that each channel consists of a complex constellation of factors. And the channel where the most factor analytic work has been done, namely the expressive channel of writing, is the one that appears to be most complex and to involve the most dimensions. Perhaps the other channels will prove to be equally complex when an equal amount of diversified analytical work has been done within them.

#### Relationships Between Pairs of Communication Channels

Of concern here are the relationships between the four verbal communication channels, two expressive and two receptive types. Reading and listening are primarily concerned with receiving information and writing and speaking with dissemination of information. Other parallels between two pairs are difficult to draw but will be mentioned whenever they exist. A word of caution, however, is that the number of test scores, especially in reading and listening, is limited in this project, and inferences drawn from these data should be viewed with caution.

Across channels there seems to be many instances of no overlap but a few instances of some overlap of factors as indicated by high correlations among specific variables. Certain scores which contain characteristics that seem to be common to two or more channels of communication correlate highly while others do not. This is indeed puzzling and warrants further research. On the other hand there are characteristics of one channel for which there is no obviously appropriate counterpart in another. And it will be a great challenge to seek out the counterparts. For example, superficially there appears to be no counterpart for voice quality in speaking. But on more thorough examination of this problem, one may find that the auditory-articulative qualities of the writing are in many ways a sufficiently suitable counterpart. No great effort was made in this study, however, to build and examine counterparts across channels.

Reading vs. Listening (Receptive Channels): The 30 correlations of the 5 listening scores with the 6 reading ones are shown in Table 28. It is interesting to note that Auditory Retention correlated with 4 of the 6 reading scores, including Reading Comprehension. Also, Auditory Retention by itself accounts for 4 of the 6 significant correlation coefficients.

The correlation between Rate of Oral Reading and Speech Sound Discrimination may suggest that a person who is more effective at reading aloud gets feedback and guidance cues through his ears that enable him to continue to read rapidly aloud. The Skimming score correlated significantly with the two most meaningful listening tasks which suggests that some essential component in skimming in reading is a central process which may function, perhaps in a skimming way, too, in typical listening comprehension tasks.

To judge from the available data, it seems that the two receptive categories, with few exceptions, are quite independent. Yet it should be understood that the number and variety of scores of the receptive type is notably limited in both categories. Perhaps with additional relevant scores more overlap between the two receptive ability areas would emerge.

Table 28

CORRELATIONS BETWEEN THE READING AND LISTENING CHANNELS

Reading Scores	Listening Scores					
	Spch. Snd. Discrimination	Auditory Retention	Sit. X. Control Tower Listening	Sit. XI. Identification of Sounds	Sit. XII. Interview Listening	
	13	14	71	72	73	
Skimming	52	15	28	01	06	32
Outlining III	53	09	09	02	-07	17
Sit. III. Lecture--ideas/notes	60	10	18	18	05	02
Sit. III. Lecture--ideas/oral	61	21	23	13	08	07
Sit. XIII. Reading Compreh.	74	10	31	13	03	21
Rate of Oral Reading	85	27	20	01	-20	18

Reading vs. Speaking: In terms of input-output sequences this combination is used by those preparing for and delivering such things as speeches, briefings, and sales talks. Most of the correlations in Table 29 were near zero and some non-zero ones were partly explained by the nature of the tasks. For example, those who paused more during their lecture had taken scanty or otherwise "poor" notes during the preparation phase and could not read from and use these notes effectively during their speech. Their reading aloud rate was slow and they were below average on reading comprehension, skimming, and outlining. Some of this relatedness may therefore be due to common central processes, such as skimming and outlining, to extract key ideas that could be used, rather than due to more purely input or output processes.

A similar profile, merely with the signs reversed, was found for the rate of public speaking. The good skimmer and outliner and reader (both silently for comprehension and aloud) was a good performer in the Emergency Telephone situation where he referred to papers and maps before sending messages by telephone. The public speaking score in the lecture and the effectiveness of reading aloud were likewise related to most of the reading scores. The next to highest correlation indicated that a person good in outlining was an effective performer in the small conference situation which had little structure except that organized into the conference by the conferees.

Reading vs. Writing: These two activities, highly discussed as being so basic in early school work, are combined frequently in homework assignments and in library work by scholars. Here a slight majority of the intercorrelations in Table 30 were significant. In several instances, reading and understanding printed verbal materials was a prerequisite to accomplishing the writing tasks. In the editing task, one must read his own revisions to see if further editing is needed. Better readers tended to produce more and a higher percent of high quality responses on the Similes I exercise. Reading comprehension is a linkage to writing and the ability to skim the printed page is apparently an effective forerunner to many writing tasks, as is outlining ability and note-taking ability. Some components underlying reading aloud also seem to function across several writing tasks.

Listening vs. Speaking: Throughout the world much of the communication in words is "by word of mouth," that is, by talking and listening. Therefore, it is interesting to note whether this frequently used combination involves highly related or lowly related processes--or perhaps even unrelated processes, merely used in combination. According to the evidence in this project, these two turn out to be the most unrelated pair of channels. Only 13% of the



Table 29

CORRELATIONS BETWEEN THE READING AND SPEAKING CHANNELS

	Reading Scores		Speaking Scores																					
Skimming	52	18	Sit. I: Conference	58	Sit. II. Oral Reading	59	Sit. III. Lecture--speaking	62	Sit. IV. Instruct. On-the-job	64	Sit. V. Emergent Leader	65	Sit. VI. Desig. Leader--total	66	Sit. VI. Desig. Leader--status	67	Sit. VII. Emergency Telephone	68	Sit. XVI. Adm. Discip. Action	77	Rate of Public Speaking	86	Seconds Pauses/minute speaking	87
Outlining III	53	52																						
Sit. III. Lecture--ideas/notes	60	06																						
Sit. III. Lecture--ideas/oral	61	18																						
Sit. XIII. Reading Compreh.	74	09																						
Rate of Oral Reading	85	06																						





intercorrelations in Table 31 were significant and these were almost equally divided in the positive and negative directions. For example, persons above average in listening to and identifying sounds were below average in Oral Reading performance and in Instruction on-the-Job (the latter being the highest correlation of  $-.41$  in the table). However, those scoring high in Interview Listening were above average in the Emergency Telephone situation and in their Rate of Public Speaking. These were the only significant correlations, but they were all barely significant (between  $.23$  and  $.25$ ) except for the lone correlation of  $-.41$  cited above.

Listening vs. Writing: This combination is one most frequently used by students in classrooms, especially in lecture situations. It is also required in important specific activities such as stenography and court reporting. Table 32 shows these 90 intercorrelations. These two channels are quite unrelated, too, with only 18% of the intercorrelations being significant. Interview Listening scores correlated significantly with 7 of the 18 writing scores but the listening identification, the listening discrimination, and the listening-through-noise scores correlated on the average with only 2 of the 18. In looking how each of the writing scores correlates across the listening scores, only the Planning of an Informative Paper Score (a judgmental planning and organizing for writing task) correlated with 4 of the 5 listening scores. The two high quality scores on Similes I correlated with 2 of the 5 listening scores. Thus the higher the quality and the more thinking and organizing and therefore the more central the processes involved, the more the writing task is related to listening. All other writing scores were related to only one or to none of the listening scores. The correlation of  $.34$  between Editing and Control Tower Listening is intriguing. One seeks to select the essence and eliminate noise and redundancy and inefficiency of expression in editing; somewhat similarly, one seeks to extract the true message from the noise in the listening task.

Speaking vs. Writing (Expressive Channels): Table 33 shows the correlation matrix of the speaking scores with the writing scores. When one asks about the relationship between speaking ability and writing ability, he should note that herein we display 228 such relationships in the form of correlations. Overall the correlation table shows that three out of four of these correlation coefficients are not significant and only a dozen are  $.40$  or higher (in absolute value). But the relationships with particular variables should be noted. One might expect some generalization of the ability to organize verbal material, whether it be expressed orally or in writing.

Table 51

CORRELATIONS BETWEEN THE LISTENING AND SPEAKING CHANNELS

	<u>Listening Scores</u>		<u>Speaking Scores</u>																					
Spch. Snd. Discrim.	13	58	Sit. I. Conference	58	Sit. II. Oral Reading	59	Sit. III. Lecture--speaking	62	Sit. IV. Instruct. On-the-job	64	Sit. V. Emergent leader	65	Sit. VI. Desig. Leader--total	66	Sit. VI. Desig. Leader--status	67	Sit. VII. Emergency Telephone	68	Sit. XVI. Adm. Discip. Action	77	Rate of Public Speaking	86	Seconds Pauses/minute speaking	87
Auditory Retention	14	59	Sit. I. Conference	14	Sit. II. Oral Reading	17	Sit. III. Lecture--speaking	13	Sit. IV. Instruct. On-the-job	07	Sit. V. Emergent leader	10	Sit. VI. Desig. Leader--total	06	Sit. VI. Desig. Leader--status	15	Sit. VII. Emergency Telephone	15	Sit. XVI. Adm. Discip. Action	03	Rate of Public Speaking	07	Seconds Pauses/minute speaking	-08
Sit. X. Control Tower Listening	71	59	Sit. I. Conference	07	Sit. II. Oral Reading	-01	Sit. III. Lecture--speaking	03	Sit. IV. Instruct. On-the-job	-04	Sit. V. Emergent leader	05	Sit. VI. Desig. Leader--total	05	Sit. VI. Desig. Leader--status	05	Sit. VII. Emergency Telephone	10	Sit. XVI. Adm. Discip. Action	-08	Rate of Public Speaking	-07	Seconds Pauses/minute speaking	08
Sit. XI. Identification of Sounds	72	59	Sit. I. Conference	02	Sit. II. Oral Reading	-24	Sit. III. Lecture--speaking	00	Sit. IV. Instruct. On-the-job	-41	Sit. V. Emergent leader	02	Sit. VI. Desig. Leader--total	03	Sit. VI. Desig. Leader--status	05	Sit. VII. Emergency Telephone	-05	Sit. XVI. Adm. Discip. Action	-15	Rate of Public Speaking	-17	Seconds Pauses/minute speaking	06
Sit. XII. Interview Listening	73	58	Sit. I. Conference	13	Sit. II. Oral Reading	24	Sit. III. Lecture--speaking	25	Sit. IV. Instruct. On-the-job	-07	Sit. V. Emergent leader	-01	Sit. VI. Desig. Leader--total	-10	Sit. VI. Desig. Leader--status	03	Sit. VII. Emergency Telephone	-03	Sit. XVI. Adm. Discip. Action	13	Rate of Public Speaking	08	Seconds Pauses/minute speaking	-23



Table 33

CORRELATIONS BETWEEN THE SPEAKING AND WRITING SCORES

	Speaking Scores										Writing Scores									
Sit. I. Conference	58	20	18-20-07	21	20	09-27	10	17	02-05	17	23	21	15-06	39	Sit. XVII. Written Interp.--	83	84			
Sit. II. Oral Reading	59	27	29-03-21	03	31	02-50	16	19	20	47	60	30	51	17	Sit. XVII. Written Interp.--	82	83			
Sit. III. Lecture--Speaking	62	16	13-23-17	16	29	03-44	10	15	05	30	50	23	53	25	Sit. XVII. Written Interp.--	81	82			
Sit. IV. Instruct. On-the-Job	64	09	06	04-13	01	07-05-23	07	13	11	05	17	07	10-07	00	Sit. XVIII. Writing I	78	79			
Sit. V. Emergent Leader	65	12	09-20-05	21	08	07-06	12	17	21-04	12	14	09	03-08-09	00	Sit. XV. Editing	76	77			
Sit. VI. Desig. Leader--total	66	01	03-07-11	01	03	10-21	14	11-01	19	16	03	27	03-11	11	Sit. XIV. Writing I	75	76			
Sit. VI. Desig. Leader--status	67	21-01	02-08-06	02	14-24	04	12	17	00-03-03	14	01	06	25	19	Sit. IX. Written Exposition	70	71			
Sit. VII. Emergency Telephone	68	11	22	10-12-05	33	15-35	17	17	16	09	29	23	24	03	Sit. VIII. Plan. Inform.	69	70			
Sit. XVI. Adm. Discip. Action	77	09	06	01	10	16	19	09-21	12	08	01	08	20	01	Sit. VII. Written Interp.--	82	83			
Rate of Public Speaking	86	11	34-01-04	13	32	16-35	14	10	08	09	29	32	38	30-02	Sit. XVII. Written Interp.--	81	82			
Seconds Pauses/minute speaking	87	-10-20	00-08-15	27-15	30-14-12	04-29-20	36-11-02-15								Sit. XVII. Written Interp.--	80	81			



The relationships between the somewhat general overall measures of speaking and writing ability are of much interest. Speaking Ability in the lecture situation and Writing I and II scores are measures of these respective abilities. The correlations between scores on speaking ability and on Writing I and II are .50 and .53, respectively. This, and the fact that certain of the more complex writing variables correlated significantly with several of the more complex speaking variables seems to indicate that there is probably some communality of speaking and writing abilities (some common input and especially some common central processes). On the other hand there appears to be a good deal of independence of these writing and talking channels, as evidenced by the large number of non-significant correlations, with a median correlation of only .13 and with only 23% of the correlations being significant--and usually barely so.

The speaking scores that cut across to the writing channel, and the writing scores that cut across to the speaking channel should be noted. The number of words/idea on Revision II, the Writing II, Writing I, and Editing scores, the number of ideas score on Revision II, and the number of ideas on the Written Interpretation Situation are the 6 writing scores which overlap the greatest number of speaking scores. In sharp contrast 7 of the 18 writing scores do not correlate with any of the key speaking situation scores. Among the speaking scores, oral reading, public speaking ability, the rate of public speaking, and the score in the Emergency Telephone situation overlap most with the writing channel scores. In contrast 6 of the 11 speaking scores only correlated with from 0 to 3 of the 18 writing scores.

These results argue for training separately in writing and in talking tasks and for training in a variety of specific tasks in each one, sampling much more than just Theme Writing and Public Speaking which are unrepresentative and atypically related to each other across these channels.

The correlation of .45 between two derived scores of Writing Organization and Speaking Organization should also be noted. These organization scores were composites of the organization subscores of several situational tests of speaking and of writing, and as such are not based on identical organizational elements but on elements assumed to be relevant to the particular ability. They argue for some common organizational activity in the central processes of the communicator, regardless of the channel of expression.

#### Summary of Results Within and Between Channels

Table 34 shows in a compact form the relations within and between these four channels of communication. In each case using

Table 34

THE MEDIAN CORRELATIONS AND PER CENT OF THE INTERCORRELATIONS SIGNIFICANT, BOTH WITHIN AND BETWEEN THE FOUR CHANNELS OF COMMUNICATION ABILITIES

	Reading (6 scores)	Listening (5 scores)	Speaking (11 scores)	Writing (18 scores)
Reading (6 scores)	.36 & 93% (15 r's)* .13 to .70*			
Listening (5 scores)	.17 & 17% (30 r's) .01 to .32	.17 & 40% (10 r's) .05 to .31		
Speaking (11 scores)	.17 & 31% (66 r's) .00 to .57	.08 & 13% (55 r's) .00 to .41	.22 & 51% (55 r's) .02 to .65	
Writing (18 scores)	.23 & 54% (108 r's) .01 to .55	.12 & 19% (90 r's) .00 to .36	.12 & 22% (198 r's) .00 to .60	.17 & 33% (153 r's) .01 to .87

\*In each box the second row shows the number of intercorrelations between the particular pair of channels and the third row presents the range of the absolute values of these intercorrelations between the channels.

absolute values of the correlations, the median correlation and the percentage of correlations that are significant are shown within the cell between two channels. This table again indicates that except for only one case that is just barely an exception, the typical correlations between channels are non-significant and close to zero. In only three cases are the median correlations significant and in two of these, namely Speaking vs. Speaking and Reading vs. Writing, they are barely significant with only 53% of the correlations between each of these pair of channels being significant at only the .05 level. In the case of Reading vs. Reading, however, the typical correlation was .72 and 76% of the correlations were significant. In all other seven pairs of channels (two pairs within and five pairs between) most of the correlations could be considered to be negligible which beautifully illustrates the complexity of the total communication ability domain explored to date.

In the various correlation tables presented in this chapter it is nearly always possible to find several "between-channel correlations" that are greater than the median correlation within each of the pair of channels. Another bigger surprise is that the typical correlation for reading vs. writing is higher than the typical within writing vs. writing correlation--or for that matter, also slightly higher than the typical within listening vs. listening correlation and the typical within speaking vs. speaking correlation. Similarly, the typical correlation between speaking vs. writing is almost equal to the typical correlation within writing vs. writing scores.

A hypothesis of equal relations (or equal absence of relations) across the board is not quite supported, but this hypothesis is close enough to serve as a crude first approximation. This "almost equal absence of relations" is most noticeable if the correlations are squared and subtracted from 1.00 to yield indices of per cent of variances not overlapped. Nine of the ten such indices derived from the medians (i.e., all except the one for reading vs. reading) range from 95% to 99% of the variances not overlapped.

#### A Third Analysis of Communication Channels Across Battery C Factors

In Battery C there were certain measures which, though not perfectly parallel to each other, seemed on the whole to be very similar, involving the same channel of communication and a similar task. Within channels of communication one might expect a large number of at least moderate intercorrelations among variables, especially where there was apparently a great deal of similarity between tests. In others the performance requirements were similar, but they involved different channels of communication. In still others the same channel of communication was involved, but the

performance requirements varied in different ways, or the information was presented in a different manner. These similarities and differences stimulated many speculations and expectations about the nature of relationships between selected variables. Samples of the questions asked were:

(1) Can an individual who performs well in one situation also perform well in another situation of a similar nature?

(2) Can an individual who can, for example, read and comprehend material well also comprehend the same type of material presented orally? The separate factors of Verbal Comprehension (Reading Comprehension) and Listening Comprehension factors provide some answer to this question.

The relationships, or more often the lack of expected relationships, led to one additional, more thorough probing of these peculiar results in a search for greater insights. This analysis differs somewhat from the first two analyses of communication channels across Battery C factors presented at the beginning of this chapter. In this case a more purified approach was used by studying only the scores used in the preceding section which were able to be classified without question into one of the four communication channels. In this way we could examine to see that each pair of test scores that seemed to be similar in nature had similar or different profiles of factor loadings. It would also be possible to further compare the four channels of communications in terms of their patterns of factor loadings and to see if anything typical could be found for each channel to distinguish it from the other three channels. Again factor loadings of .22 and over for each of the retained scores were listed and the total number of factor loadings of .22 and over for each score and for each factor were also determined as part of this analysis.

Reading: The reading scores collectively had loadings on 16 of the 25 factors. The other most noticeable result among the reading variables is that all of them loaded .20 or more on Factor 0, Concentration and Efficiency in Dealing with Messages. (Yet, eight scores from the other three channels also loaded on this factor.) The remaining reading loadings, none being extremely high, are scattered over several factors. Scores 60 and 61 are quite similar to each other. In these the subject first read the material and then recorded or reported, as the case might be, the information he had read. These two scores loaded extremely high on Factor 0 and, of course, relatively little on the other factors.

In typical practice, reading ability is usually tested by some kind of reading comprehension measure in which the individual reads



some material and then answers questions about the material. The Reading Comprehension situation score (#74) is such a measure. It had a relatively low loading on Factor O and also smaller loadings on three other factors. Again we are limited in our speculations by having too few reading measures to draw upon. Our guess, however, is that an increase in the number and variety of reading measures will result in an increase of the complexity of the factor structure.

Listening: The scattering of the loadings of the listening scores tends to indicate the complex nature of the listening channel of communications. The factor loadings of the five listening scores spread widely over 14 of the 25 factors. Especially was this picture of scattered loadings true for the more complex listening scores. For example, one might expect Auditory Retention of verbal material (score 14) to be a more difficult or complex task than Speech Sound Discrimination (score 13): i.e., the former should involve more factors with significant loadings than the latter. This was definitely the case in the present analysis. Another interesting note is a comparison of scores 14 and 73. These were two auditory retention tasks which were somewhat similar but yet did not correlate significantly. The pattern of factor loadings of these two scores are quite different from each other, as might be expected from their low intercorrelation. These results open the question as to what degree the relationship would be between test scores that are even more parallel than these two. Unfortunately there are too few measures here, many problems and complexities do appear even with these few measures, leading to many speculations. Perhaps with more listening measures, we will be able to replace these speculations with more factors applicable to listening and more insight into the complexities in the listening domain.

Speaking: The 11 speaking scores have one or more factor loadings on 16 of the 25 factors. For the most part the highest factor loadings are scattered across several factors, although several of the speaking scores load quite highly on Factor N, Organizing Ability. It should be noted also that score 62, a general speaking ability score, loaded to a small degree on each of five factors rather than highly on one factor. This suggests that any general speaking ability score is a complex phenomenon consisting of several components or factors. All the factor loadings argue that speaking ability consists of a number of factors and which ones of these factors are functioning depends upon the type of speaking task.

Writing: The 18 writing scores also present a very complex picture, with loadings scattered over 23 of the 25 factors. Very important is the fact that scores 75 and 78, previously noted as



general writing measures, loaded .20 or more on five factors each, the highest loadings for each one being about .50. This seems to indicate strongly that general writing ability involves a composite of a large number of different factors rather than just one or only a few. This would also tend to indicate that by themselves, single measuring instruments, even as complex as these general writing tasks, miss large portions of the total writing area and that many relatively simple measures would be needed to cover all the factors involved in effectively measuring all writing abilities. No single factor, moreover, can be readily identified as the one that is most common to the writing scores.

As we look across channels, there appear to be some factors that are relevant to more than one channel and some relevant primarily to only one. Whether this observation would hold if more tests were used is uncertain. Since the four channels above loaded on 16, 14, 16, and 23 of the 25 factors, respectively, it is again fairly obvious that very few factors could be distinctive to one and only one channel. It is also clear that nearly all of the factors were multiple channel factors, often involving more than two channels. This result of great complexity, within and across channels, is, of course, consistent with the findings in the previous section of this chapter. What appears to be necessary in order to determine the interrelations among communication channels more clearly is to develop and administer four large batteries of tests that each cover "exhaustively" one of the four channels of communication, and to factor analyze the resulting scores first for each battery separately, and then for all four channels together.

It is believed that the results in this chapter alone are sufficient to justify the present project because of the frequency with which these questions about relations between channels have been asked--and yet any empirical answers to these questions have generally been lacking heretofore.

## Chapter X

### VALIDITIES OF BATTERY C PREDICTOR SCORES

It will be recalled that the composition of Battery C permitted each of the 60 predictor scores (including the three rate of talking scores) to be validated against 27 criterion scores. As a first analysis, different types of predictors were examined to find which ones showed the most promise for being valid. The list below indicates the average number of times that each general type of predictor score was valid against the 27 criterion scores. The number in parentheses shows the number of scores entering into each average. For all 60 predictor scores this average was 7.1 times valid out of a possible 27.

#### Average Number of Valid Scores

Multi-Score Tests--pooling all scores/test (17)	18.1	New Self Reports (19)	7.4
Rate of Talking Scores (3)	14.0	New Tests (41)	7.4
Reading Scores (8)	11.5	Writing Scores (32)	7.2
Existing Aptitude Tests (12)	9.7	Multi-Score Tests--per separate score (51)	6.8
Test with a Single Score (9)	8.7	Existing Tests (19)	6.5
Tests Other than Self Reports (34)	8.2	Speaking Scores (13)	5.8
New Aptitude Tests (22)	7.4	Self Report Tests (26)	5.7
		Listening Scores (7)	4.0
		Existing Self Reports (7)	1.1

The three rate of talking scores were added late in the study and had experimental dependence with scores from criterion situations from which they were derived. Nonetheless, these three scores proved to have a remarkably high average number of significant validities. Each of these scores could be obtained rather efficiently. A rate of oral reading score could be obtained by having a person read aloud a standard complex page of printed materials until he finished in which case his time required for completion would be the score. The rate of talking score could be obtained by tape recording him in a conversation for two or three minutes and taking time samples. The amount of pauses could likewise be obtained relatively easily from such recordings. This finding suggests that in all probability performances were being judged implicitly on speed of talking and on non-pausing during the oral expression situational tests. Perhaps these smooth, continuous, faster talking rates are usually positively related to the effectiveness of oral presentations, including the aliveness and excitement and enthusiasm transmitted to the audience. But there may be some exceptions to this rule where the slower, more thoughtful and deliberate expression proves to be

more effective and provocative. To the degree that the latter is true, then perhaps the scoring of our criterion situational tests should be modified, at least if we are scoring for depth or provocativeness of the messages delivered.

In comparing the predictor scores representing the four channels of communications it was found that the reading scores came out highest even though there were only two criterion scores classified as primarily involving reading. Writing scores came second which is more understandable since there were nine writing criterion scores. Speaking predictor scores, however, only ranked third, possibly because of their indirect nature, in spite of the fact that almost half the criterion scores were speaking or talking scores. And listening scores are ranked last of the four channels, as might be expected from the small number of listening scores among the criteria.

When the test scores were divided as coming from existing tests or new tests, the new tests on the average showed more significant validities (7.4 vs. 6.5). When all scores were divided into self-report versus non-self-report scores, the self-report scores had noticeably fewer significant validities (5.7 vs. 8.2). When aptitude test scores were subdivided, the existing aptitude test scores showed a higher number of validities than did the new aptitude tests (9.7 vs. 7.4) because collectively they were so highly selected to cover a wide range of dimensions with factor composition in mind. When self-report scores were divided into existing self-report scores (scores from existing personality tests) and new self-report scores, there was no contest for the existing personality test scores almost failed to have any validity whatsoever with an average of only 1.1 significant validities out of a possible 27. New self-report scores did much better with an average of 7.4 which is slightly above the average of all 60 scores in the battery.

A last comparison was between tests with single scores and tests with multiple scores. The single score tests proved to have a greater number of significant validities per score (8.3 vs. 6.8). However, if one modifies this comparison and tallies the number of significant validities per test instead of per score, the single test scores still show 8.7 significant validities while the multiple-scored tests show 18.1 validities per test (that is if you pool the validities for all scores on each test before computing the average). This last finding argues strongly for having good tests which can be scored in multiple different ways, with each one of its scores having some particular significant validity of its own.

Table 35 lists the frequency distribution of the validity coefficients and the number of significant validity coefficients for each predictor score. In one sense, this table provides a validity profile for each predictor score.

Table 35

ABSOLUTE VALUE OF VALIDITY COEFFICIENTS  
OF EACH PREDICTOR WITH 27 CRITERIA

<u>Variable Name</u>	.00	.10	.20	.30	.40	.50	.60	.70	No.*
22 Revision II--words/idea	4	2	8	4	7	2			18
10 Vocabulary	5	4	4	4	4	4	1	1	17
26 All-Round Ability--write	7	4	2	8	5	1			16
33 Word Association--total	2	9	5	8	3				16
85 Rate of Oral Reading	6	4	6	4	5	2			16
2 Satis. Ability--write	8	4	9	1	5				15
3 Satis. Ability--read	6	5	4	6	4	2			15
20 Revision II--ideas	7	3	6	7	3	1			14
34 Word Assoc.--unpop.	6	6	8	3	3	1			14
53 Outlining III	6	7	4	7	1	2			14
86 Rate of Public Speaking	8	4	3	9	3				14
1 Satis. Ability--speak	5	9	7	2	2	2			13
27 All-Round Ability--read	7	6	5	7	1	1			13
45 Soc. Instit.--indirect	7	6	4	9	1				13
5 First and Last Letters	11	4	6	5	1				12
35 Word Assoc.--ave. qual.	6	7	8	4	2				12
52 Skimming	8	5	6	7	1				12
87 Pauses Seconds/minute speak.	11	3	6	7	2				12
4 Satis. Ability--listen	8	7	8	2	2				11
6 Verbal Classification	2	10	13	2					11
40 Phrase Check List--neg.	11	4	6	5		1			11
9 Plot Titles--clever	7	8	7	5					10
11 Topics--quantity	7	10	7	3					8
25 All-Round Ability--speak	6	11	3	4	3				8
24 Similes I--high	4	16	7						7
37 Brick Uses--categ. chgs.	10	8	7	2					7
48 Comp. Words II--total	7	10	8	1	1				7
56 Biog. Info.--read	9	9	8		1				7
23 Similes I--% high	8	12	7						6
39 Phrase Check List--pos.	8	11	6	2					6
7 Similes I--total	8	12	6	1					5
19 Letter Star II--2 & 3 resp.	12	9	5	1					5
30 Diff. Score--write	10	11	5	1					5
38 Brick Uses--total	7	13	6	1					5
55 Biog. Info.--write	7	14	5	1					5
13 Spch. Snd. Discrim.	11	11	4	1					4
14 Auditory Retention	11	11	3	2					4
21 Revision II--words	10	13	4						4
47 Qual. of Super. Spkr.	15	7	5						4
54 Biog. Info.--speak	16	7	4						4

Table 35 (Con't.)

<u>Variable Name</u>	.00	.10	.20	.30	.40	.50	.60	.70	No.*
12 Topics--changes	10	12	5						3
28 All-Round Ability--listen	11	12	4						3
43 Test of Insight--achiev. mot.	8	15	3	1					3
49 Comp. Words II--qual.	16	8	2	1					3
15 Telegram II--ideas	13	8	6						2
18 Letter Star II--1st resp.	19	5	2	1					2
41 Test of Insight--affil.	10	14	3						2
16 Telegram II--words	12	12	3						1
29 Diff. Score--speak	18	5	4						1
31 Diff. Score--read	16	8	3						1
32 Diff. Score--listen	15	7	5						1
36 Word Assoc.--qual. var.	17	7	3						1
42 Test of Insight--status	13	13	1						1
50 PE Scale--anxiety	18	8	1						1
51 PE Scale--lies	17	7	3						1
57 Biog. Info.--listen	14	11	2						1
8 Plot Titles--non-clever	18	9							0
17 Telegram II--words/idea	19	5	3						0
44 Soc. Instit.--direct	18	8	1						0
46 The Empathy Test	20	7							0

\*Number of significant validities against 27 criterion scores.



Many of the predictor scores had significant validities with a multitude of criteria as seen at the top of the list, whereas others predicted only a few of the criteria. From these frequencies it can be seen that slightly more than one-third of the predictor scores had 10 or more out of a possible 27 significant validities. The ratio score of words per idea on Revision II had the most significant validities, correlating with two-thirds of the criterion scores. Vocabulary was next, with 17 validities.

The writing self-rating on the All-Round Ability Scale was valid for 16 criteria, as were the Word Association total score and the Rate of Oral Reading score. Both the writing and the reading scores on the Satisfactory Ability Scale had 15 significant validities; the ideas score on Revision II, the Outlining III score, the unpopular response score on Word Association, and the Rate of Public Speaking score showed 14 significant validities. It is noteworthy that many of the self report scales correlated significantly with a large number of the criteria. In fact, 8 of the 20 predictors with the highest number of significant validities were self report scores.

On the other extreme, the table indicates that the non-clever score on Plot Titles, the ratio score on Telegram Writing III, the superficial changes score on Social Institutions, and the Empathy score had no significant validities. The nine scores with only one significant validity (always only in the .20's) were the number-of-words score on Telegram Writing III, the difference-in-self ratings aspiration scores on speaking, reading, and listening, the variation in quality score on Word Association, the status score from the Test of Insight, the manifest anxiety and the lie scores from the PE Scale, and the listening score from the Biographical Information Blank. One reason why some of these scores, such as the Telegram Writing scores, the status score, and the variation in quality score, failed to predict well is that there were few, if any, communication scores of their types among the criteria.

Inspection of Table 35 shows that with few exceptions, the scores with the greatest members of significant validities tended to have the highest average validities with all the criterion scores and the highest individual validities with any single criterion. It was a rare phenomenon for a score to have one single validity standing alone above that score's distribution of validities, although the negative score on the Phrase Check List showed this unusual pattern.

The Battery C communalities for all of these 60 predictor scores (see Table 47 in Appendix III) were first examined to represent crude underestimates of the reliabilities of the predictor

scores. It was heartening to find that these communalities had a median of .81 and ranged from .67 to .91, with 85% being .75 or above.

As indicated earlier, across the 25 factors in Battery C, the factor complexity of the predictor scores varied from 1 to 8, with nearly half of the predictor scores being of factor complexity 4 or greater. Again this is evidence of the dimensional complexity of this verbal communication domain.

The factorial complexity was checked to see if it was related to the number of significant validities for the predictor scores. The relationship was close to zero and for all practical purposes was negligible. This means that the scores which were more frequently valid across the multiple criteria were neither more complex nor more simple factorially than the other predictor scores in Battery C.

From the analyses in this chapter one can see that the predictors showed variation from simplicity to complexity in terms of their pattern of correlations with criteria of differing nature. The number of significant validity coefficients across a variety of different predictors suggests that several good general batteries and also several good general batteries and also several good differential prediction (i.e., classification) batteries could probably be readily identified for predicting communication abilities in typical communication situations in the world of work. These problems will be dealt with later in Chapter XII. However, to be more sure of the picture as far as criterion coverages are concerned, the next chapter (Chapter XI) will deal with how predictable each criterion was and what its correlates were.

## CHAPTER XI

### CRITERION PREDICTABILITY AND CRITERION CORRELATES

The predictability of each of the 27 criteria can be seen in Table 36. About half of the criteria were predicted by at least one-fourth of the 60 predictor scores. The overall Oral Reading score and the rating on Writing I were the most predictable criteria, with more than 50 per cent of the predictor scores being valid against these criteria.

In viewing the results according to criterion channels, it can be seen that the two reading criteria each had 24 valid predictors; the nine writing criteria had an average of 17 valid predictors; the 13 speaking criteria had 11.5 significant predictors; and the three listening criteria had an average of 11 significant predictors. The latter two had fewer valid predictors largely because of the composition of the set of predictors and the newness of measurement attempts in these two difficult areas.

The four least predictable criteria having only from 0-2 valid predictors were the Emergent Leadership score, the distortion score on the Classroom Lecture, the status score on the Designated Leadership situation, and the interest score on the Written Interpretation of a Higher Directive. Other criterion scores low on the list were another error score, a distortion score, another Designated Leader score, the Conference score, and the Identification of Sounds score. In general, there were not many predictor scores of a sufficiently similar nature to these criterion scores to enable them to be adequately predicted.

A trend found for criterion scores was that if they had many valid predictors, they usually also correlated with several of the other criterion scores, and conversely. This trend was modified to some degree because the emphasis in the set of predictors differed somewhat from the emphasis in the set of criteria. For example, speaking criteria showed a higher percentage of correlates with the other criteria than with the predictor scores--partly because the set of criteria emphasized speaking scores more than did the set of predictors.

Table 37 presents the frequency distributions of the correlations of each criterion with all other criteria. Again the criteria with the most significant correlates were listed at the top. The number of correlates per criterion score ranged from 0 to 17 out of a possible 26 other criteria. This tables gives some insight into the relative dependence or independence of each criterion score--

Table 36

## PREDICTABILITY OF EACH CRITERION SCORE

Criterion Score	Validities (absolute values)							No.*	
	.00	.10	.20	.30	.40	.50	.60		.70
59 Sit. II. Oral Reading	13	9	13	14	7	4			35
75 Sit. XIV. Writing I	10	12	18	8	7	4		1	33
62 Sit. III. Lecture--speaking	11	17	13	11	7	1			29
78 Sit. XVIII. Writing II	11	18	11	7	9	4			29
80 Writing Organization	17	13	12	8	9	1			28
81 Speaking Organization	14	17	14	11	3	1			28
74 Sit. XIII. Reading Compreh.	13	15	13	12	5	1	1		27
69 Sit. VIII. Plan. Inform. Paper	17	15	15	9	3	1			25
76 Sit. XV. Editing	22	14	19	3	2				20
60 Sit. III. Lecture--ideas/notes	19	22	12	7					19
61 Sit. III. Lecture--ideas/oral	26	9	13	7	2				19
68 Sit. VII. Emergency Telephone	16	24	9	11					19
70 Sit. IX. Written Exposition	14	23	17	5		1			18
73 Sit. XII. Interview Listening	21	22	10	7					17
71 Sit. X. Control Tower Listening	29	13	14	2	2				14
84 Sit. XVII. Written Interp.-idea	19	25	13	3					13
77 Sit. XVI. Adm. Discip. Action	26	18	11	5					11
64 Sit. IV. Instruct. On-the-Job	31	20	8	1					8
83 Sit. XVII. Written Interp.-dis.	32	19	8	1					8
58 Sit. I. Conference	25	22	10	1	1	1			7
66 Sit. VI. Desig. Leader--total	30	19	10	1					6
72 Sit. XI. Identification of Snds.	30	25	5						3
79 Sit. III. Lecture--errors	36	20	4						3
82 Sit. XVII. Written Interp.-int.	29	24	6	1					3
67 Sit. VI. Desig. Leader--status	35	18	6	1					2
63 Sit. III. Lecture--distortion	35	21	3	1					1
65 Sit. V. Emergent Leader	35	23	2						0

\*Number of Significant Validities per Criterion Score from 60 Predictor Scores.

Table 37

## INTERCORRELATIONS OF EACH CRITERION WITH OTHER 26 CRITERION SCORES

Criterion Score	Intercorrelations (absolute values)								No.*
	.00	.10	.20	.30	.40	.50	.60	.70	
80 Writing Organization	4	5	7	4	3	1	1	1	17
62 Sit. III. Lecture--speaking	6	3	6	6	1	3		1	17
78 Sit. XVIII. Writing II	4	6	5	4	2	4		1	15
76 Sit. XV. Editing	7	5	10	3		1			14
59 Sit. II. Oral Reading	6	5	5	4	2	3	1		13
75 Sit. XIV. Writing I	4	6	6	3	2	3	2		13
81 Speaking Organization	3	8	3	6	3		1	2	13
74 Sit. XIII. Reading Compreh.	5	6	5	5	4	1			12
68 Sit. VII. Emergency Telephone	11	3	7	4				1	11
61 Sit. III. Lecture--ideas/oral	7	9	5	3	1			1	10
69 Sit. VIII. Plan. Inform. Paper	6	8	6	5	1				10
77 Sit. XVI. Adm. Discip. Action	11	4	5	6					10
58 Sit. I. Conference	9	6	4	6			1		9
60 Sit. III. Lecture-ideas/notes	10	9	4	2				1	7
70 Sit. IX. Written Exposition	10	9	1	3	3				7
84 Sit. XVII. Written Interp-idea	11	8	3	4					6
66 Sit. VI. Desig. Leader--total	11	9	6						5
73 Sit. XII. Interview Listening	9	11	4	2					5
64 Sit. IV. Instruct. On-the-Job	14	7	4		1				4
65 Sit. V. Emergent Leader	16	6	3	1					3
71 Sit. X. Control Tower Listen.	13	9	3	1					3
82 Sit. XVII. Written Interp-int.	13	8	3	2					3
67 Sit. VI. Desig. Leader--status	18	4	4						2
72 Sit. XI. Identification of Snds.	16	7	2		1				2
79 Sit. III. Lecture--errors	18	6	2						1
83 Sit. XVII. Written Interp-dist.	18	7	1						1
63 Sit. III. Lecture--distortion	16	10							0

\*Number of Significant Intercorrelations for Each Criterion Score.



i.e., how much this score is related or unrelated to the other situational criterion scores.

The criteria also ranged from relatively simple or specific to very complex, as evidenced by their intercorrelations with the other criterion scores. About 50 per cent of the criteria had significant correlations with one third or more of the other criteria. The public speaking rating on the Classroom Lecture and the composite Speaking Organization criterion had significant correlations with 17 other criterion scores, the rating on Writing II had 15 significant correlations, and the Editing score had 14.

At the other extreme, the distortion score in the Classroom Lecture had no correlates. The error score in the Classroom Lecture and the addition-plus-distortion score on the Written Interpretation of a Higher Directive had only one significant correlation. The status score on Designated Leadership and the Identification of Sounds score had only two significant correlations with other criteria.

The communalities for the 27 criterion scores in the factor analysis of the entire Battery C (60 predictors plus 27 criteria) ranged from .71 to .91, with more than three-fourths of them being .79 or above (See Table 47 in Appendix III). These provide a crude "lower bounds" indication of what the reliabilities would be for these situational criterion scores, and they are surprisingly high for a first study on situational criteria for communication abilities.

While these communalities and the two tables above indicate some overlapping of measures in the domain of communication, they also support the earlier observation of the complexity of this domain, which was evident from the absence of overlap between pairs of scores in the majority of cases. Only 25 per cent of the validity coefficients were significant and slightly less than 30 per cent of the criterion intercorrelations were significant, even though the criterion scores tended to be complex composites.

In spite of this complexity it is felt that a good "batting average" and many sizable validity coefficients were obtained in this exploratory study into the total communication area, especially since the criteria were designed to be different and the predictors were not built to relate to each and every criterion. Nonetheless, at this early stage it was believed that, with a few exceptions, a practical predictor battery could be selected and recommended with some confidence for each of the criteria. The next chapter will deal with the formation of different predictor batteries of different lengths for each of the 27 criteria.

## Factor Analysis of Battery C Criterion Scores

In order to view the criterion domain from another perspective which can facilitate better understanding of the communications area, a factor analysis was accomplished on only the 27 criterion scores in Battery C. This factor study was undertaken in addition to the factor analysis of all 87 predictor and criterion scores in Battery C, presented earlier in Chapter VIII.

The 27 criterion scores in Battery C were factor analyzed by machine methods using the principal component method to obtain ten factors having an eigen value greater than 1.00. These factors were then rotated orthogonally to simple structure. The nine interpreted factors were described by the following titles, some of which resemble earlier factors found especially in the other factor analysis study of all 87 Battery C Scores:

Oral Communication Ability	Transmission of Information
Written Communication Ability	Quality of Communications in
Idea Retention Facility	Leadership Actions
Focus on Reception Over	De-emphasis of Details in Oral
Expression	Communications
Attention on Accuracy of Details	Distortion of Information

One factor dealt primarily with speaking ability while a second primarily with writing ability. There was still a third factor which seemed to involve both expression and reception scores, and it was, therefore, interpreted in terms of these two classes of scores. The other factors are apparently more characteristic of two or more channels of communication than they are of any particular channel. For Example, information can be distorted either in written or in spoken form; and crucial details can be neglected either in written or in spoken communications. From the factor analysis it seems that the domain of communication was covered quite adequately by revealing factors related to channels of communication and to factors cutting across these channels. More detailed information about this factor analysis study is contained in Appendix IV.

### Correlates with Each Criterion Score

In order to understand each criterion better, this section will be devoted to an intensive look at the content, scoring method, and empirical results for each criterion, in turn. The descriptions that follow, together with the tables just presented, will provide an adequate interpretation of the criterion score in terms of the type of communication performance that it actually represents.

Each criterion score is described by considering: (1) how the score was arrived at from the data collected in the laboratory situation from which it was educed, (2) what the significant predictor correlates were, and (3) what the significant criterion correlates were with this score. These correlates are given in the order of their magnitudes in the lists presented for each criterion score.

To recapitulate, then, the following section contains a correlational and verbal description of the criterion scores derived from the situational laboratory tests. One can find herein a description of each criterion score--what it is called and how it was derived--and a list and short interpretation of its correlates with both predictor and criterion scores.<sup>7</sup> The criterion scores will be examined more thoroughly in terms of their predictability in two kinds of multiple correlational analysis in the next chapter.

#### Conference Situation I--Total Score Correlates

Score 58 derived from situational test I measures the ability to perform orally in a small conference situation. The conference involved the discussion of a military subject by four men of approximate peer status.

A. Scoring description. This composite score was obtained from observer ratings of oral adequacy, quality of oral leadership, and group interaction.

#### B. Correlates with predictors.

53 Outlining III	.52	22 Revision II--words/idea	-.27
86 Rate of Public Speaking	.45	48 Comp. Words II--total	.25
45 Soc. Inst.--indirect	.34	37 Seconds Pauses/minute	
37 Brick Uses--categ. chgs.	.28	speaking	-.23

The predictor correlates indicate that this score on conference communications is predicted significantly by: (a) the Spontaneous Flexibility landmark factor, and (b) the following abilities measured by the new predictor tests: Verbal Originality, Rate of Public Speaking, and ideas extraction and compact expression activities as measured in Revision II ratio score and Outlining III, the latter two being factorially complex predictors.

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<sup>7</sup>The reader may find it advisable to skim the following pages on criterion correlates which are presented in outline form for ease of reference.

C. Correlates with other criterion scores.

81 Speaking Organization	.66	77 XVI. Adm. Discip. Action	.31
62 III. Lecture--speaking	.39	80 Writing Organization	.31
84 XVII. Written Interp.-idea	.39	64 IV. Instruct. On-the-Job	.25
65 V. Emergent Leadership	.38	66 VI. Desig. Leader--total	.25
68 VII. Emergency Telephone	.31	76 XV. Editing	.23

The criterion correlates indicate that this score is related to other situational scores measuring the ability to organize written and spoken material, to perform well in extemporaneous oral situations, to extract important ideas from written material, to express them well, and to edit.

Oral Reading Situation II--Total Score Correlates

Score 59 derived from situational test II measures the ability to read complex instructions orally. A prepared copy of complex instructions was given to each subject to read aloud without any practice to an audience of four people.

A. Description of the scoring method. This composite score of performance was obtained from observer ratings of voice quality, delivery quality, and personality factors involved in the reading. The performance was recorded on tape for subsequent study.

B. Correlates with predictors.

85 Rate of Oral Reading	.57	87 Seconds Pauses/minute spking-	.34
34 Word Assoc.--unpop.	.52	39 Phrase Check List--pos.	.33
10 Vocabulary	.51	45 Soc. Instit.--indirect	.33
22 Revision II--words/idea	.50	53 Outlining III	.33
1 Satis. Ability--speak	.49	20 Revision II--ideas	.31
26 All-Round Ability--write	.49	9 Plot Titles--clever	.30
35 Word Assoc.--ave. qual.	.46	6 Verbal Classification	.29
25 All-Round Ability--speak	.41	11 Topics--quantity	.29
48 Comp. Words II--total	.41	47 Qual. of Super. Spkr.	.29
52 Skimming	.40	7 Similes I--total	.27
56 Biog. Info.--read	.40	38 Brick Uses--total	.27
3 Satis. Ability--read	.39	4 Satis. Ability--listen	.26
40 Phrase Check List--neg.	.39	54 Biog. Info.--speak	.26
86 Rate of Public Speaking	.38	37 Brick Uses--categ. chgs.	.24
33 Word Assoc.--total	.37	30 Diff. Score--write	.23
2 Satis. Ability--write	.36	36 Word Assoc.--qual. var.	.23
5 First and Last Letters	.36	49 Comp. Words II--sound	.22
27 All-Round Ability--read	.36		
55 Biog. Info.--write	.36		



The predictor correlates indicate that this oral reading score is predicted significantly by more tests than any other criterion in the study. These tests measure: (a) the landmark factors of Associational Fluency, Verbal Knowledge, Originality, Verbal Classification, Ideational Fluency, Spontaneous Flexibility, and Word Fluency; and (b) a multitude of other abilities which include measures of Broadly Diffused Attention, Verbal Originality, and self-ratings on Expression and Writing Abilities, Aspiration in Communication Abilities, and Negative Self-Report on Communication Traits, speed of talking scores, plus other tests of complex factorial structure. The best number of significant correlations with this criterion score (nearly two thirds of the predictors) implies that oral reading is a complex task requiring many different abilities and skills. From the numerous tests of different types that relate to this criterion one can assume that the ability to read orally can be predicted with considerable accuracy by using combinations of tests in this study.

C. Correlates with other criterion scores.

75 XIV. Writing I	.60	74 XIII. Reading Compreh.	.31
62 III. Lecture--speaking	.56	77 XVI. Adm. Discip. Action	.30
78 XVIII. Writing II	.51	76 XV. Editing	.30
80 Writing Organization	.50	64 Instruct. On-the-Job	.28
70 IX. Written Exposition	.47	72 XI. Identification of Snds.-	.24
81 Speaking Organization	.41	73 XII. Interview Listening	.24
68 VII. Emergency Telephone	.35		

The criterion correlates indicate that this score is related to other situational scores measuring writing, editing, reading, listening, and speaking abilities found in various tasks. The fact that about half of the criterion scores correlate significantly with oral reading substantiates the above statements based on the predictor correlates; namely, that the score is complex and related to a large number of communication ability scores. It is surprising to find that various writing criterion scores are among the highest in correlation with oral reading performance.

Classroom Lecture Situation III--Preparation Score Correlates

Score 60 derived from situational test III measures the ability to prepare notes for a lecture. The quantity of notes was limited by allowing each participant only one 3 x 5 card on which he could make notes to be used in presenting a lecture about a complex military subject to a moderately large audience.



A. Description of the scoring method. This score is a total of the number of essential ideas extracted from the given factual data and meaningfully recorded on the 3 x 5 card.

B. Correlates with predictors.

26 All-Round Ability--write	.35	53 Outlining III	.28
3 Satis. Ability--read	.34	40 Phrase Check List--neg.	-.27
87 Seconds Pauses/ minute speaking	-.33	22 Revision II--words/idea	-.27
20 Revision II--ideas	.33	86 Rate of Public Speaking	.27
33 Word Assoc.--total	.32	4 Satis. Ability--listen	.26
27 All-Round Ability--read	.31	7 Satis. Ability--speak	.24
10 Vocabulary	.30	23 Similes I--% high	.23
2 Satis. Ability--write	.29	6 Verbal Classification	.22
5 First and Last Letters	.28	24 Similes I--high	.22
		85 Rate of Oral Reading	.22

The predictor correlates indicate that this note-taking score is predicted significantly by: (a) tests that measure the landmark factors of Associational Fluency, Verbal Knowledge, Ideational Fluency, Word Fluency, and Verbal Classification; and (b) other abilities measured by the new predictor tests which measure Aspiration in Communication Abilities, self-reports on Expressional Ability and Writing Ability, and Negative Self-Report on Communication Traits (negatively related). Other predictors of complex factorial structure are also related to this criterion including the three rate of talking scores.

C. Correlates with other criterion scores.

61 III. Lecture--ideas/oral	.70	69 VIII. Plan. Inform. Paper	.27
74 XIII. Reading Compreh.	.37	75 XIV. Writing I	.27
78 XVIII. Writing II	.37	76 XV. Editing	.26
80 Writing Organization	.29		

The criterion correlates indicate that this score is related to other situational scores measuring the factual data actually presented in a lecture (since this criterion is a score of the factual notes used in the lecture), the ability to read and comprehend meaning, the ability to write well, and to edit. This score appears to be complex and related to a moderately high number of communication ability scores.

Classroom Lecture Situation III--Factual Data Score Correlates

Score 61 derived from situational test III measures the ability to present factual data in an oral situation. The information written on a 3 x 5 card and other information remembered from the

study of the given factual data provided the subject with the material used in a five-minute military intelligence report to an audience of 15 observer-raters.

A. Description of the scoring method. This score obtained from observer-raters in the listening audience measured the number of essential facts meaningfully presented by the speaker in the briefing session.

B. Correlates with predictors.

10 Vocabulary	.49	86 Rate of Public Speaking	.31
87 Seconds Pauses/minute speaking	-.45	33 Word Assoc.--total	.30
22 Revision II--words/idea	.41	27 All-Round Ability--read	.29
53 Outlining III	.41	2 Satis. Ability--write	.29
85 Rate of Oral Reading	.40	4 Satis. Ability--listen	.29
3 Satis. Ability--read	.39	24 Similes I--high	.27
40 Phrase Check List--neg.	-.37	23 Similes I--% high	.26
20 Revision II--ideas	.37	1 Satis. Ability--speak	.25
26 All-Round Ability--write	.33	14 Auditory Retention	.23
52 Skimming	.31	34 Word Assoc.--unpop.	.22

The predictor correlates indicate that this lecture-idea score is predicted significantly by: (a) tests that measure the landmark factors of Verbal Knowledge, Associational Fluency, and Ideational Fluency; and (b) other abilities measured by the new predictor tests, which include measures of Aspiration in Communication Abilities, self-report on Expression and Writing Abilities, Negative Self-Report on Communication Traits, Broadly Diffused Attention, Listening Comprehension, and the three rate of talking scores. In addition, factorially complex scores on Revision II and Outlining III are related to this criterion.

C. Correlates with other criterion scores.

60 III. Lecture--ideas/notes	.70	80 Writing Organization	.29
74 XIII. Reading Compreh.	.46	75 XIV. Writing I	.29
78 XVIII. Writing II	.38	76 XV. Editing	.28
81 Speaking Organization	.32	62 III. Lecture--speaking	.27
69 VIII. Plan. Inform. Paper	.30	68 VII. Emergency Telephone	.23

The criterion correlates indicate that this score is related to other situational scores measuring the number of ideas recorded on the lecture notes, the ability to comprehend written material, the ability to organize and to write, the ability to edit, and the ability to speak extemporaneously and spontaneously.

Classroom Lecture Situation III--Speaking Ability Rating Score  
Correlates

Score 62 derived from situation III measured the speaking ability displayed during an oral lecture to an audience of moderate size.

A. Description of the scoring method. This composite score obtained from observer raters in the listening audience measured organization of presented material, lecture content, and quality of delivery.

B. Correlates with predictors.

40 Phrase Check List--neg.	-.53	1 Satis. Ability--speak	.32
25 All-Round Ability--speak	.46	48 Comp. Words II--total	.31
87 Seconds Pauses/minute speaking	-.45	34 Word Assoc.--unpop	.31
26 All-Round Ability--write	.44	30 Diff. Score--write	-.31
22 Revision II--words/idea	-.44	27 All-Round Ability--read	.30
86 Rate of Public Speaking	.43	20 Revision II--ideas	.29
45 Soc. Instit.--indirect	.41	51 PE Scale--lie	.29
10 Vocabulary	.41	56 Biog. Info.--read	.28
85 Rate of Oral Reading	.36	3 Satis. Ability--read	.28
53 Outlining III	.33	52 Skimming	.26
39 Phrase Check List--pos.	.33	9 Plot Titles--clever	.26
35 Word Assoc.--ave. qual.	.33	41 Test of Insight--affil.	.24
33 Word Assoc.--total	.32	54 Biog. Info.--speak	.23
5 First and Last Letters	.32	15 Telegram III--ideas	-.23
		37 Brick Uses--categ. chgs.	.23

The predictor correlates indicate that this speaking ability score is predicted significantly by: (a) tests that measure the landmark factors of Verbal Knowledge, Sensitivity to Problems, Associational Fluency, Word Fluency, Originality, and Spontaneous Flexibility; and (b) abilities indicated by the new tests as measuring Negative Self-Report on Communication Traits (negative relation), Aspiration in Communication Abilities, self-report on Expression and Writing Abilities, Verbal Originality, Broadly Diffused Attention, and the three rate of talking scores. This criterion score is a very complex one, since it correlates with nearly half of the predictors, which cover a wide variety of abilities and characteristics. It is noteworthy that the number of negative reports a person checks about himself on speaking traits has the highest validity in predicting this criterion with a negative validity, as expected. The lie score correlated positively with this criterion.

C. Correlates with other criterion scores.

81 Speaking Organization	.70	84 XVII. Written Interp.--idea	.31
59 II. Oral Reading	.56	70 IX. Written Exposition	.30
78 XVIII. Writing II	.53	66 VI. Desig. Leader--total	.29
75 XIV. Writing I	.50	61 III. Lecture--ideas/oral	.27
80 Writing Organization	.46	67 VI. Desig. Leader--status	.27
74 XIII. Reading Compreh.	.39	82 XVII. Written Interp.--int.	.25
58 I. Conference	.39	73 XII. Interview Listening	.25
68 VII. Emergency Telephone	.36	76 XV. Editing	.23
77 XVI. Adm. Discip. Action	.32		

The criterion correlates indicate that this score is related to other situational scores measuring oral and written organization, writing, reading comprehension, listening, communication in a conference, and other expressional abilities. This score ties with score 80 in having the largest number of correlations with the other criterion situations. This score is quite complex and is related in some degree to 17 out of the 26 other situational test scores.

Classroom Lecture Situation III--Distortion Score Correlates

Score 63 derived from situation III measured the tendency one has to distort factual information when presenting a lecture to an audience of moderate size.

A. Description of the scoring method. This composite score taken from tape recordings represents the total number and degree of distortions of the basic data as presented in the oral lecture.

B. Correlates with predictors.

38 Brick Uses--total .35

The predictor correlates indicate that this distortion score is predicted significantly by only the Brick Uses landmark test, which is a complex measure that has appeared on Ideational Fluency, Idea Listing Ability, Verbal Originality, and Spontaneous Flexibility factors. No other predictor correlates were significantly related to this score.

C. Correlates with other criterion scores.

None

No criterion correlates were significantly related to this score, a fact which indicates that it is quite different from most of the other communication scores included in the study.

### On-the-Job Training Situation IV--Total Score Correlates

Score 64 derived from situation IV measured the ability to conduct on-the-job training in a military context. The subjects were required to train two new men in the use of a Springfield 30-06 rifle. Each subject was trained to a minimum level of performance prior to his instructional period with the new men, for which he had no forewarning.

A. Description of the scoring method. This composite score obtained from observer-raters measures the ability to establish rapport with new trainees, provide orientation in new topics, explain and demonstrate adequately new methods, allow for individual practice, and present oral instructions.

#### B. Correlates with predictors.

1 Satis. Ability--speak	.30	2 Satis. Ability--write	.23
3 Satis. Ability--read	.24	10 Vocabulary	.22
85 Rate of Oral Reading	.24	47 Qual. Super. Spkr.	.22
30 Diff. Score--write	.23		
22 Revision II--words/idea	-.23		

The predictor correlates indicate that this instructional score is predicted significantly by tests that measure: (a) the landmark factor of Verbal Knowledge; and (b) the new self-report measures of expressional ability, Aspiration in Communication Abilities, and the Rate of Oral Reading. Though the relationships were low, the better instructors used fewer words per idea in the Revision II test, and judged superior speakers to have favorable characteristics to an extreme degree.

#### C. Correlates with other criterion scores.

72 XI. Identification of Sounds	-.41	58 I. Conference	.25
59 II. Oral Reading	.28	77 XVI. Adm. Discip. Action	.24

The criterion correlates indicate that this score is related to a few other situational scores measuring oral reading, conference communication, and administration of disciplinary action. It is also negatively related to the ability to identify aurally various common sounds, which is its highest correlate.

### Emergent Leadership, Problem Solving Situation V--Total Score Correlates

Score 65 derived from situation V measures the ability to communicate in a non-structured small group situation permitting



emergent leadership. No status differentiation was imposed on the group of four men performing the problem solving in this situation.

A. Description of the scoring method. This composite score obtained from observer-raters measures the ability to voluntarily organize, instruct, and motivate a small group of peers confronted with a rather complex problem solving task.

B. Correlates with predictors.

None

There were no significant predictor correlates with this emergent leadership criterion score.

C. Correlates with other criterion scores.

58 I. Conference	.38	81 Speaking Organization	.25
68 VII. Emergency Telephone	.27		

The few criterion correlates with this score indicate that it is moderately related to the ability to communicate in a conference, ability to communicate by telephone in an emergency situation, and the ability to organize material in an oral expression situation.

Designated Leadership Situation VI--Total Score Correlates

Score 66 derived from situation VI measured the ability to communicate in a structured small group situation. The subject was instructed to perform as supervisor of two men on a physical labor job.

A. Description of the scoring method. This composite score obtained from observer-raters measures the ability to give oral communication which will organize, instruct, and motivate the two men doing the job.

B. Correlates with predictors.

45 Soc. Instit.--indirect	.33	19 Letter Star II--2 & 3 resp.	.26
54 Biog. Info.--speak	.27	39 Phrase Check List--pos.	.24
40 Phrase Check List--neg.	-.27	42 Test of Insight--status	.22

The predictor correlates indicate that designated leadership score is predicted significantly by: (a) tests that measure the landmark factors of Expressional Fluency; and (b) other abilities indicated by the self-reports as Expressional Ability and as Negative Self-Report on Communication Traits (negatively correlated),

and by other tests that measure need-for-status motivation and writing ability.

C. Correlates with other criterion scores.

77 XVI. Adm. Discip. Action	.29	58 I. Conference	.25
62 III. Lecture--speaking	.29	80 Writing Organization	.23
78 XVIII. Writing II	.27		

The criterion correlates indicate that this score is related moderately to a few other situational tests that measure certain abilities to speak and write in various situations, such as administering disciplinary action, lecturing ability, conference communicating, and organizing written materials.

Designed Leadership Situation VI--Status Need Score Correlates

Score 67 derived from situational test VI measured the need for attainment of status in a structured small group situation. The subject was instructed to perform as supervisor of two men on a small job.

A. Description of the scoring method. This score was obtained from observer recordings of the frequency count of statements made by the subject which were related to status attainment only, but not directly to job performance.

B. Correlates with predictors.

25 All-Round Ability--speak	.30	22 Revision II--words/idea	-.24
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The predictor correlates indicate that the status-need score is predicted significantly by a Self-Estimate of Expressional Ability and negatively by the wordiness per idea on the Revision II task.

C. Correlates with other criterion scores.

62 III. Lecture--speaking	.27	84 XVII. Written Interp.--idea	.25
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The criterion correlates indicate that this score is slightly related to only two other situational scores measuring the ability to lecture and the ability to transmit given ideas when writing an interpretation of a higher directive.

Emergency Telephone Action Situation VII--Total Score Correlates

Score 68 derived from situational test VII measured the ability to communicate by telephone in an emergency situation. The

subject was instructed to inform those he felt should be informed in a specific emergency on an air base.

A. Description of the scoring method. This composite score obtained from observer-raters considered voice quality, organizational content of the communication, and personality factors.

B. Correlates with predictors.

10 Vocabulary	.39	26 All-Round Ability--write	.30
85 Rate of Oral Reading	.38	35 Word Assoc.--ave. qual,	.28
53 Outlining III	.37	33 Word Assoc.--total	.23
37 Brick Uses--categ. chgs.	.37	13 Spch. Snd. Discrim.	.23
3 Satis. Ability--read	.36	2 Satis. Ability--write	.23
22 Revision II--words/idea	-.35	87 Seconds Pauses/minute	-.22
86 Rate of Public Speaking	.34	speaking	
52 Skimming	.33	11 Topics--quantity	.22
34 Word Assoc.--unpop.	.33	9 Plot Titles--clever	.22
20 Revision II--ideas	.33	56 Biog. Info.--read	.22

The predictor correlates indicate that this emergency telephone score is predicted significantly by: (a) tests that measure the landmark factors of Verbal Knowledge, Spontaneous Flexibility, Associational Fluency, Ideational Fluency, and Originality; and (b) other abilities measured by the new predictor tests, yielding Verbal Originality, Broadly Diffused Attention, Listening Comprehension, Aspiration in Communication Abilities, Self-Estimates of Expressional and Writing Abilities, and the three rate of talking scores and other complex scores.

C. Correlates with other criterion scores.

81 Speaking Organization	.70	65 V. Emergent Leadership	.27
62 III. Lecture--speaking	.36	77 XVI. Adm. Discip. Action	.25
59 II. Oral Reading	.35	78 XVIII. Writing II	.24
80 Writing Organization	.33	76 XV. Editing	.23
58 I. Conference	.31	61 III. Lecture--ideas/oral	.23
75 XIV. Writing I	.29		

The criterion correlates indicate that this score is related to other situational scores measuring speaking organization (a spurious relation), lecturing ability, oral reading, writing organization and ability, ability to communicate in a non-structured group, conference communicating, emergent leadership, and the ability to edit.

### Planning an Informative Paper Situation VIII--Total Score Correlates

Score 69 derived from situational test VIII measured the ability to plan an informative paper for a specific reading audience. The information to be organized was presented to the subjects on a set of cards, with instructions to organize the cards in the best sequence for his reading audience.

A. Description of the scoring method. The score obtained from a key indicates how much the obtained outline deviated from the ideal one.

#### B. Correlates with predictors.

10 Vocabulary	.52	26 All-Round Ability--write	.30
3 Satis. Ability--read	.48	11 Topics--quantity	.29
85 Rate of Oral Reading	.41	1 Satis. Ability--speak	.29
2 Satis. Ability--write	.40	52 Skimming	.27
20 Revision II--ideas	.30	38 Brick Uses--total	.27
22 Revision II--words/idea-	.38	24 Similes I--high	.26
14 Auditory Retention	.36	47 Qual. Super. Spkr.	.25
33 Word Assoc.--total	.34	5 First and Last Letters	.25
27 All-Round Ability--read	.33	32 Diff. Score--listen	.24
4 Satis. Ability--listen	.33	53 Outlining III	.23
34 Word Assoc.--unpop.	.32	23 Similes I--% high	.22
13 Spch. Snd. Discrim.	.31	7 Similes I--total	.22
		21 Revision II--words	.22

The predictor correlates indicate that this outline organizing score is predicted significantly by tests that measure: (a) the landmark factors of Verbal Knowledge, Associational Fluency, Ideational Fluency, and Word Fluency; and (b) many other abilities indicated by the new tests which include measures of Self-Estimates of Expression and Writing Ability, Aspiration in Communication Abilities, Listening Comprehension, Verbal Originality, Broadly Diffused Attention, Idea Listing Ability, the Rate of Oral Reading, plus other scores of complex nature. The many significant correlations with this score indicate that Planning an Informative Paper is a complex task. However, one will notice that most of the significant correlates are measures of reading, writing, or listening; few are related to scores on actual speaking performance, so one can assume that this score is somewhat independent from the actual speaking ability such as lecturing.

#### C. Correlates with other criterion scores.

74 XIII. Reading Compreh.	.42	61 III. Lecture--ideas/oral	.30
70 IX. Written Exposition	.38	71 X. Control Tower Listening	.28
73 XII. Interview Listening	.34	60 III. Lecture--ideas/notes	.27
78 XVIII. Writing II	.33	76 XV. Editing	.27
75 XIV. Writing I	.32	80 Writing Organization	.23

The criterion correlates indicate that this score is related to reading comprehension, to listening ability, and mostly to writing abilities. These related writing scores include writing exposition, writing new material, number of ideas present in writing exposition, and the ability to edit and organize written material. Correlations with oral performances are missing in this set of statistics. The reading comprehension criterion score correlates higher than other criteria with this score.

Written Exposition for a Specific Audience Situation IX--Total Score Correlates

Score 70 derived from situational test IX measured the ability to write expositions for a specific audience. The exposition was based on the cards organized in situation VIII.

A. Description of the scoring method. This score, obtained from two professional theme readers, was based on traditional college writing criteria: grammar, organization, interest, form, etc.

B. Correlates with predictors.

10 Vocabulary	.50	1 Satis. Ability--speak	.27
52 Skimming	.35	56 Biog. Info.--read	.26
85 Rate of Oral Reading	.35	4 Satis. Ability--listen	.25
26 All-Round Ability--write	.33	49 Comp. Words II--sound	.25
27 All-Round Ability--read	.31	40 Phrase Check List--neg.	-.25
22 Revision II--words/idea	-.30	33 Word Assoc.--total	.24
35 Word Assoc.--ave. qual.	.28	2 Satis. Ability--write	.24
34 Word Assoc.--unpop.	.28	11 Topics--quantity	.24
39 Phrase Check List--pos.	.27	5 First and Last Letters	.23

The predictor correlates indicate that this writing exposition score is predicted significantly by tests that measure: (a) the landmark factors of Verbal Knowledge, Associational Fluency, Ideational Fluency, and Word Fluency; and (b) several abilities revealed by the new tests such as Broadly Diffused Attention, Aspiration in Communication Abilities, Self-Estimate of Expressional and Writing Ability, Verbal Originality, Rate of Oral Reading, and Negative Self-Report on Communication Traits (negative validity). Other scores of complex nature are also related to this criterion.



Vocabulary stands out above the other predictors, with a correlation of .50. It does appear that this criterion score can be predicted well by its list of significant predictors.

C. Correlates with other criterion scores.

59 II. Oral Reading	.47	69 VIII. Plan. Inform. Paper	.38
78 XVIII. Writing II	.43	62 III. Lecture--speaking	.30
75 XIV. Writing I	.43	80 Writing Organization	.29
74 XIII. Reading Compreh.	.39		

The criterion correlates indicate that this score is related mainly to writing ability. However, the measure of oral reading shows up strongly as well as the reading comprehension score, so this criterion score is fairly complex. The two other main writing tasks, the writing organization score, and the organizing of the card outline prior to the writing task in the present situation all relate to this criterion score.

Control Tower Listening Situation X--Total Score Correlate

Score 71 derived from situational test X measured the ability to understand air control messages in a control tower listening situation. Recordings of control tower radio communications of varying difficulty were played to the subjects. Their task was to listen to the messages and write exactly what they heard on an answer sheet.

A. Description of the scoring method. This score obtained from a key of the complete messages reflects the number of words correctly heard.

B. Correlates with predictors.

2 Satis. Ability--write	.41	26 All-Round Ability--write	.25
3 Satis. Ability--read	.41	6 Verbal Classification	.23
18 Letter Star II--1st resp.	.38	9 Plot Titles--clever	.23
19 Letter Star II--2 & 3 resp.	.31	12 Topics--changes	.22
4 Satis. Ability--listen	.29	13 Spch. Snd. Discrim.	.22
33 Word Assoc.--total	.27	28 All-Round Ability--listen	.22
27 All-Round Ability--read	.26	54 Biog. Info.--speak	-.22

The predictor correlates indicate that this Control Tower Listening score is predicted significantly by tests that measure: (a) the landmark factors of Expressional Fluency, Associational Fluency, Verbal Classification, Originality, and Ideational Fluency, and (b) other abilities indicated by the new tests, such as

Aspiration in Communication Abilities, Self-Estimate of Expressional and Writing Abilities, Verbal Originality, and Listening Comprehension.

C. Correlates with other criterion scores.

76 XV. Editing	.34	72 XI. Identification of	
69 VIII. Plan. Inform. Paper	.28	Sounds	.25

The criterion correlates indicate that this score is related to a minor degree to only three other situational test scores. Since one had to listen carefully through control tower noise to receive the message, it is reasonable that the ability to identify sounds is related to this score. The other two correlates were editing and organizing note cards prior to writing an informative paper. It is clear that this listening score is quite independent of most criterion scores in this study.

Identification of Sounds Situation XI--Total Score Correlates

Score 72 derived from situation test XI measured the ability to identify 12 common sounds from a tape recording.

A. Description of the scoring method. This score obtained from a key measures the ability to identify sounds with their natural origin.

B. Correlates with predictors.

29 Diff. Score--speak	-.29	15 Telegram III--ideas	-.23
14 Auditory Retention	.25		

The predictor correlates indicate that this Identification of Sounds score is not significantly predicted by any of the established landmark factors. It is predicted significantly by only three of the new tests, those which measure Aspiration in Communication Abilities, Wordiness of Expression, and Listening Comprehension, with negative validities for the first two of these.

C. Correlates with other criterion scores.

64 IV. Instruct. On-the-Job	-.41	59 II. Oral Reading	-.24
71 X. Control Tower Listening	.25		

This score is similarly related to only three of the other situational scores, positively with Control Tower Listening, and negatively with On-the-Job Training and Oral Reading. The lack of

significant correlations indicates that this score is rather independent with regard to the predictor and the situational scores in this study.

Interview Listening Situation XII--Total Score Correlates

Score 73 derived from situational test XII measures the ability to listen to a two-way conversation and understand and retain the important information. A recorded interview situation provided the information to be retained by the subjects.

A. Description of the scoring method. This score obtained from a key measures the number of correct statements retained from the interview situation.

B. Correlates with predictors.

52 Skimming	.32	26 All-Round Ability--write	.28
33 Word Assoc.--total	.32	48 Comp. Words II--total	.27
11 Topics--quantity	.32	34 Word Assoc.--unpop.	.26
22 Revision II--words/idea	-.31	20 Revision II--ideas	.25
10 Vocabulary	.31	5 First and Last Letters	.25
35 Word Assoc.--ave. qual.	.30	6 Verbal Classification	.25
7 Similes I--total	.30	87 Seconds Pauses/minute	
45 Soc. Instit.--indirect	.29	speaking	-.23
37 Brick Uses--categ. chgs.	.28	30 Diff. Score--write	-.22

The predictor correlates indicate that this Interview Listening score is predicted significantly but not to a very high degree by: (a) several tests that measure the landmark factors of Verbal Knowledge, Associational Fluency, Ideational Fluency, Spontaneous Flexibility, Word Fluency, and Verbal Classification; and by (b) other abilities measured by the new measures of Broadly Diffused Attention, Verbal Originality, Self-Estimates of Expressional and Writing Abilities, Aspiration in Communication Abilities, and the score on pausing while speaking (negatively related). Although the validity coefficients are all moderate, with the use of multiple predictors it appears that this criterion score of listening skill can be adequately predicted.

C. Correlates with other criterion scores.

75 XIV. Writing I	.36	62 III. Lecture--speaking	.25
69 VIII. Plan. Inform. Paper	.34	59 II. Oral Reading	.24
82 XVII. Written Interp.--interest	.29		

The criterion correlates indicate that this score is related to three situational scores measuring writing ability, such as

organizing notes, writing a directive, and writing a composition. Lecturing ability and oral reading are barely significantly related to this ability. It appears to be a moderately complex task that is predicted by several predictor tests and is relatively independent with regard to the other listening tasks.

Reading Comprehension Situation XIII--Total Score Correlates

Score 74 derived from situational test XIII measures the ability to understand written passages of varying types. This reading comprehension test required the subject to interpret poetry, prose, and semiscientific material by answering multiple choice questions about given passages of material.

A. Description of the scoring method. This total score was obtained from a correct answer key, which measures one's reading comprehension ability.

B. Correlates with predictors.

10 Vocabulary	.63	43 Test of Insight--achiev.mot.	.31
27 All-Round Ability--read	.53	40 Phrase Check List--neg.	-.31
85 Rate of Oral Reading	.49	25 All-Round Ability--speak	.31
22 Revision II--words/idea-	.41	14 Auditory Retention	.31
3 Satis. Ability--read	.41	11 Topics--quantity	.31
26 All-Round Ability--write.	.40	5 First and Last Letters	.31
20 Revision II--ideas	.40	24 Similes I--high	.29
6 Verbal Classification	.39	2 Satis. Ability--write	.29
87 Seconds Pauses/minute	-.36	1 Satis. Ability--speak	.29
speaking		23 Similes I--% high	.28
52 Skimming	.36	4 Satis. Ability--listen	.28
55 Outlining III	.35	45 Soc. Instit.--indirect	.27
86 Rate of Public Speaking	.35	12 Topics--changes	.27
33 Word Assoc.--total	.32	56 Biog. Info.--read	.23

The predictor correlates indicate that this Reading Comprehension score is predicted significantly by tests that measure: (a) the landmark factors of Verbal Knowledge, Verbal Classification, Associational Fluency, Ideational Fluency, and Word Fluency; and (b) a host of other abilities which include measures of Aspiration in Communication Abilities, Self-Estimate in Expressional and Writing Abilities, Broadly Diffused Attention, Achievement Motivation, Listening Comprehension, Verbal Originality, Wordiness of Expression, Negative Self-Report on Communication Traits (negative correlation), and the three rate of talking scores. From these data, one can assume that the ability to comprehend written material can be predicted with considerable accuracy by the tests in this study. It is a complex area, but the absence of the large majority

of the predictors from the above list indicates that many communication abilities are not related to this score.

C. Correlates with other criterion scores.

78 XVIII. Writing II	.52	62 III. Lecture--speaking	.39
75 XIV. Writing I	.48	60 III. Lecture--ideas/notes	.37
61 III. Lecture--ideas/oral	.46	81 Speaking Organization	.32
69 VIII. Plan. Inform. Paper	.42	59 II. Oral Reading	.31
80 Writing Organization	.41	76 XV. Editing	.26
70 IX. Written Exposition	.39	79 III. Lecture--errors	.23

The criterion correlates indicate that this score is related to other situational scores which measure writing ability, oral reading of complex instructions, lecturing ability, editing, and speaking organization. The ability to organize and deliver ideas is related to this score. Again, as with the predictor correlates, there are some significant correlates here, but the absence of many of the oral performance scores and listening scores indicates that this score, even though correlated with many tests and criterion scores, is not too extremely complex. Many of its criterion correlates are closely related themselves, giving some indication that this score is somewhat narrow in its coverage.

Writing I Situation XIV--Total Score Correlates

Score 75 derived from situational test XIV measured the ability to write spontaneously about a topic that is relatively new. A stimulus paragraph was given to each subject to expand into meaningful writing.

A. Description of the scoring method. This composite score measures correctness in grammar, spelling, mechanics, specific details, ability to communicate a central impression in writing, imagination, clarity, and sense.

B. Correlates with predictors.

10 Vocabulary	.71	9 Plot Titles--high	.30
22 Revision II--words/idea-	.56	87 Seconds Pauses/minute	-.29
85 Rate of Oral Reading	.55	speaking	
20 Revision II--ideas	.54	48 Comp. Words II--total	.29
1 Satis. Ability--speak	.52	19 Letter Star II--2 & 3 resp.	.29
2 Satis. Ability--write	.48	86 Rate of Public Speaking	.29
26 All-Round Ability--write.	.44	25 All-Round Ability--speak	.28
35 Word Assoc.--ave. qual.	.43	7 Similes I--total	.28
3 Satis. Ability--read	.43	52 Skimming	.27
34 Word Assoc.--unpop.	.42	43 Test of Insight-achiev. mot.	.27



33 Word Assoc.--total	.42	6 Verbal Classification	.26
4 Satis. Ability--listen	.40	56 Biog. Info.--read	.25
27 All-Round Ability--read	.39	47 Qual. Super. Spkr.	.25
53 Outlining III	.37	12 Topics--changes	.24
40 Phrase Check List--neg.--	.33	55 Biog. Info.--write	.22
11 Topics--quantity	.31	21 Revision II--words	.22
5 First and Last Letters	.31		

The predictor correlates indicate that this Writing I score is predicted significantly by 30 predictor scores that are direct or indirect scores of reading, writing, speaking, and listening activities. These test scores measure: (a) the landmark factors of Verbal Knowledge with very high validity, Associational Fluency, Verbal Classification, Ideational Fluency, Originality, Expressional Fluency, and Word Fluency; and (b) many other abilities correlated with this score significantly as indicated by the new tests measuring Aspiration in Communication Abilities, Self-Estimate of Expressional, Listening, and Writing Abilities, Verbal Originality, Negative Self-Report on Communication Traits (negatively related), Broadly Diffused Attention, Wordiness of Expression, Listening Comprehension, and the three rate of talking scores. Other complex scores such as words per idea in the Revision II test, achievement motivation, and the average quality and unpopular response scores on Word Association predicted this criterion. Because of the numerous valid predictors one must consider this criterion to be a complex comprehensive task that has many ramifications as far as the ability to communicate content is concerned.

C. Correlates with other criterion scores.

80 Writing Organization	.67	81 Speaking Organization	.39
59 II. Oral Reading	.60	73 XII. Interview Listening	.36
78 XVIII. Writing II	.55	69 VIII. Plan. Inform. Paper	.32
76 XV. Editing	.50	68 VII. Emergency Telephone	.29
62 III. Lecture--speaking	.50	61 III. Lecture--ideas/oral	.29
74 XIII. Reading Compreh.	.48	60 III. Lecture--ideas/notes	.27
70 IX. Written Exposition	.43		

The criterion correlates indicate that this score is related to writing organization, editing, and other scores that are predominantly extracted from writing situational tasks, plus oral reading, lecture ideas, lecture distortion, emergency telephone communicating, reading comprehension, and interview listening scores. This score is therefore quite complex and has writing, reading, listening, and speaking correlates.

### Editing Situation XV--Total Score Correlates

Score 76 derived from situational test XV measures how well a person can edit poorly written material. The task required each subject to edit and rewrite a poorly written passage of printed material.

A. Description of the scoring method. This composite score represents a ranking according to the composite criterion of (1) conciseness, (2) clarity, (3) competeness, and (4) good form.

#### B. Correlates with predictors.

20 Revision II--ideas	.49	19 Letter Star II--2 & 3 resp.	.26
22 Revision II--words/idea	-.45	6 Verbal Classification	.26
10 Vocabulary	.36	2 Satis. Ability--write	.26
26 All-Round Ability--write	.33	18 Letter Star II--1st resp.	.25
86 Rate of Public Speaking	.32	3 Satis. Ability--read	.25
53 Outlining III	.29	85 Rate of Oral Reading	.25
33 Word Assoc.--total	.28	9 Plot Titles--high	.23
16 Telegram III--words	-.28	21 Revision II--words	.23
11 Topics--quantity	.27	35 Word Assoc.--ave. qual.	.23
34 Word Assoc.--unpop.	.27	40 Phrase Check List--neg.	-.23

The predictor correlates indicate that this editing score is predicted significantly by: (a) tests that measure the landmark factors of Verbal Knowledge, Associational Fluency, Ideational Fluency, Expressional Fluency, Verbal Classification, and Originality, and (b) many other new measures, including Aspiration in Communication Abilities, Self-Estimates of Expressional and Writing Abilities, Verbal Originality, Wordiness of Expression, Listening Comprehension, Rate of Public Speaking, Rate of Oral Reading, and Negative Self-Report on Communication Abilities (negative validity). Again, as found for other writing types of scores, this criterion score does not relate to many measures of speaking and listening. It is predominantly measured by writing tests. The two most valid scores were both from the Revision II test, which should be related to complex editing work.

#### C. Correlates with other criterion scores.

75 XIV. Writing I	.50	74 XIII. Reading Compreh.	.26
71 X. Control Tower Listening	.34	60 III. Lecture--ideas/notes	.26
81 Speaking Organization	.30	83 XVII. Written Interp.-dis.	-.24
59 II. Oral Reading	.30	68 VII. Emergency Telephone	.23
80 Writing Organization	.28	62 III. Lecture--speaking	.23
61 III. Lecture--ideas/oral	.28	58 I. Conference	.23
69 VIII. Plan. Inform. Paper	.27	78 XVIII. Writing II	.22

The criterion correlates indicate that this score is related to other situational scores measuring mainly writing and reading abilities, but also reading comprehension, one listening score, and five speaking scores. Oral Reading again correlates significantly with this particular test, as it has with other writing tests. The number of intercorrelations with the other situational criteria makes this score appear to be rather complex.

Disciplinary Action Situation XVI--Total Score Correlates

Score 77 derived from situational test XVI measures the ability to communicate to a person of lower organizational status in a disciplinary situation.

A. Description of the scoring method. This composite score obtained from observer-raters measures judgment, control, overt behavior, and organizational ability.

B. Correlates with predictors.

45 Soc. Instit.--indirect	.37	34 Word Assoc.--unpop	.29
26 All-Round Ability--write	.35	10 Vocabulary	.26
35 Word Assoc.--ave. qual.	.32	2 Satis. Ability--write	.24
3 Satis. Ability--read	.32	37 Brick Uses--categ. chgs.	.23
55 Biog. Info.--write	.29	1 Satis. Ability--speak	.22

The predictor correlates indicate that this Disciplinary Action score is predicted significantly by: (a) tests that measure the landmark factors of Verbal Knowledge and Spontaneous Flexibility; and (b) the measures of Aspiration in Communication Abilities, Self-Estimates of Expression and Writing Abilities and Verbal Originality. Self-ratings and the landmark factors listed above seem to predict this performance score only moderately well, since the highest correlated score was only .37. It is interesting that the most valid predictor was the far-reaching, insightful score on the Social Institutions test, which suggests that an ability to look beyond the obvious and superficial is valuable in disciplinary situations. Although this score is not predicted as well as some other criteria, it can still be validly predicted and should be regarded as an element of military behavior that can be measured by psychological means.

C. Correlates with other criterion scores.

81 Speaking Organization	.37	59 II. Oral Reading	.30
62 III. Lecture--speaking	.32	66 VI. Desig. Leader--total	.29
84 XVII. Written Interp.-idea	.31	68 VII. Emergency Telephone	.25
80 Writing Organization	.31	78 XVIII. Writing II	.24
58 I. Conference	.31	64 IV. Instruct. On-the-Job	.24

The criterion correlates indicate that this score is related to other scores measuring mainly the ability to talk and also the ability to write in various situations.

Writing II Situation XVIII--Total Score Correlates

Score 78, derived from situational test XVIII, measures the ability to write about a subject that is briefly described prior to the writing.

A. Description of the scoring method. This composite score measures correctness in grammar, use of specific details, ability to write so as to create a central impression, ability to organize written material, and imagination.

B. Correlates with predictors.

26 All-Round Ability--write	.56	87 Seconds Pause/minute speaking	-.36
10 Vocabulary	.56	45 Soc. Instit.--indirect	.35
3 Satis. Ability--read	.54	9 Plot Titles--clever	.35
1 Satis. Ability--speak	.53	52 Skimming	.33
2 Satis. Ability--write	.49	53 Outlining III	.29
4 Satis. Ability--listen	.47	24 Similes I--high	.29
22 Revision II--words/idea	-.46	55 Biog. Info.--write	.28
85 Rate of Oral Reading	.44	35 Word Assoc.--ave. qual.	.28
27 All-Round Ability--read	.43	23 Similes I-- $\frac{1}{2}$ high	.27
25 All-Round Ability--speak	.43	6 Verbal Classification	.27
5 First and Last Letters	.42	39 Phrase Check List--pos.	.25
86 Rate of Public Speaking	.38	41 Test of Insight--affil.	.22
20 Revision II--ideas	.37	28 All-Round Ability--listen	.24
40 Phrase Check List--neg.	-.37		

The predictor correlates indicate that this Writing II score is predicted significantly by 23 scores that measure: (a) the landmark factors of Verbal Knowledge, Word Fluency, Originality, and Verbal Classification; and (b) several other abilities in the new tests including Aspiration in Communication Abilities, Self-Estimates of Expression and Writing Abilities, Negative Self-Report on Communication Traits (negative validity), Broadly Diffused Attention, the three rate of talking scores, and Need-for-Affiliation Motivation. From these data it can be seen that this writing score represents a complex ability requiring many skills for a satisfactory



performance. This score was predicted very well by a large group of the predictor tests, which measured writing and reading directly and listening and talking indirectly.

C. Correlates with other criterion scores.

80 Writing Organization	.72	60 III. Lecture--ideas/notes	.37
75 XIV. Writing I	.55	82 XVII. Written Interp.--int.	.34
62 III. Lecture--speaking	.53	69 VIII. Plan. Inform. Paper	.33
74 XIII. Reading Compreh.	.52	66 VI. Desig. Leader--total	.27
59 II. Oral Reading	.51	77 XVI. Adm. Discip. Action	.24
81 Speaking Organization	.40	68 VII. Emergency Telephone	.24
70 IX. Written Exposition	.43	76 XV. Editing	.22
61 III. Lecture--ideas/oral	.38		

The criterion correlates indicate that this score is related to other situational scores measuring writing skills, talking ability in various situations, and reading comprehension. The fact that more than half of the criterion scores relate significantly with this score indicates that it is a complex communication score. These findings are similar to those for the Writing I situation.

Classroom Lecture Situation III--Error Score Correlates

Score 79 derived from situational test III measures the number of errors included in the lecture presentation. An error was assumed to be any significant deviation (other than omission) from the factual data provided for each subject to cover in his lecture.

A. Description of the scoring method. The score obtained from observer raters was a total of the deviations from the factual data.

B. Correlates with predictors.

6 Verbal Classification	-.27	50 PE Scale--Anxiety	-.22
13 Spch. Snd. Discrim.	-.22		

The predictor correlates indicate that this Lecture Error score is predicted significantly by only one of the tests measuring a landmark factor, Verbal Classification, with a negative relationship. It is also significantly related negatively to two other predictor tests; Speech Sound Discrimination and the manifest anxiety score on the PE scale. These two measure Listening Comprehension and Negative Self-Report on Communication Traits, respectively. The person with better sound discrimination and the more anxious person made fewer content errors during their lecture. No other statements can be made regarding this error score, except that it was not pre-



can be made regarding this error score, except that it was not predicted well by the test scores used in this battery.

C. Correlates with other criterion scores.

74 XIII. Reading Compreh. -.23

The only criterion correlate was a low negative one with Reading Comprehension, measuring accuracy of understanding, which would be expected to relate negatively to errors in lecture content. This error or distortion criterion score is thus independent of other criterion scores in this study.

Writing Organization Score Correlates

Score 80 obtained from situations XIV and XVIII is a composite measure of the ability to organize written material.

A. Description of the scoring method. This score was obtained by summing those sub-parts from the score sheets for the Writing I and Writing II situations which pertained only to the organization of the material written.

B. Correlates with predictors.

3 Satis. Ability--read	.53	5 First and Last Letters	.34
20 Revision II--ideas	.49	25 All-Round Ability--speak	.33
10 Vocabulary	.48	53 Outlining III	.32
1 Satis. Ability--speak	.48	52 Skimming	.27
2 Satis. Ability--write	.47	9 Plot Titles--clever	.27
34 Word Assoc.--unpop.	.45	87 Seconds Pauses/minute	
22 Revision II--words/idea	-.45	speaking	-.26
33 Word Assoc.--total	.40	23 Similes I--% high	.24
26 All-Round Ability--write	.40	21 Revision II--words	.24
85 Rate of Oral Reading	.40	43 Test of Insight--achiev. mot.	.23
45 Soc. Instit.--indirect	.39	24 Similes I--high	.23
4 Satis. Ability--listen	.38	6 Verbal Classification	.23
86 Rate of Public Speaking	.38	28 All-Round Ability--listen	.22
27 All-Round Ability--read	.36	19 Letter Star II--2 & 3 resp.	.22
35 Word Assoc.--ave. qual.	.35		

The predictor correlates indicate that this Writing Organization score is predicted significantly by: (a) tests that measure the landmark factors of Verbal Knowledge, Associational Fluency, Word Fluency, Originality, Expressional Fluency, and Verbal Classification; and (b) a multitude of other measures including Aspiration in Communication Abilities, Self-Estimates of Expression and Writing Abilities, Verbal Originality, Broadly Diffused Attention,

Wordiness of Expression, Achievement Motivation, and the three rate of talking scores. These correlates indicate that this situational task is very complex, involving many abilities and skills for its satisfactory completion. But it seems possible to predict satisfactorily ability to organize a piece of writing by using the valid tests of this study.

C. Correlates with other criterion scores.

78 XVIII. Writing II	.72	82 XVII. Written Interp.--int.	.30
75 XIV. Writing I	.67	70 IX. Written Exposition	.29
59 II. Oral Reading	.50	61 III. Lecture--ideas/oral	.29
62 III. Lecture--speaking	.46	60 III. Lecture--ideas/notes	.29
81 Speaking Organization	.45	76 XV. Editing	.28
74 XIII. Reading Compreh.	.41	84 XVII. Written Interp.--idea	.26
68 VII. Emergency Telephone	.33	69 VIII. Plan. Inform. Paper	.23
77 XVI. Adm. Discip. Action	.31	66 VI. Desig. Leader--total	.23
58 I. Conference	.31		

The criterion correlates indicate that this score is related to other situational scores measuring nearly everything except listening ability. In fact, this writing-organization score correlated with 17 out of the other 26 criterion scores, so that it ties with the speaking ability score from the Classroom Lecture for the largest number of criterion correlates in the study. It is, therefore, a very complex criterion score. However, its two highest correlations are spuriously high because of common subscores.

Speaking Organization Score Correlates

Score 81 derived from situations I, III, and VII measured the ability to deliver material orally in such a way that it is well organized.

A. Description of the scoring method. This composite score was obtained by summing the sections of the three score sheets which pertained to speaking organization ability. The score sheets were for the Conference, Classroom Lecture, and Emergency Telephone Action situations.

B. Correlates with predictors.

53 Outlining III	.53	9 Plot Titles	.30
22 Revision II--words/idea	.47	2 Satis. Ability--write	.29
86 Rate of Oral Speaking	.46	40 Phrase Check List--neg.	.27
10 Vocabulary	.42	48 Comp. Words II--total	.26
26 All-Round Ability--write	.39	38 Brick Uses--total	.25
52 Skimming	.38	35 Word Assoc.--ave. qual.	.25

3 Satis. Ability--read	.38	4 Satis. Ability--listen	.25
85 Rate of Oral Reading	.36	34 Word Assoc.--unpop.	.24
20 Revision II--ideas	.35	39 Phrase Check List--pos.	.24
87 Seconds Pauses/minute speaking	-.33	24 Similes I--high	.23
45 Soc. Instit.--indirect	.32	56 Biog. Info.--read	.23
33 Word Assoc.--total	.32	1 Satis. Ability--speak	.23
37 Brick Uses--categ. chgs.	.31	55 Biog. Info.--write	.22
25 All-Round Ability--speak	.30	27 All-Round Ability--read	.22

The predictor correlates indicate that this Speaking Organization score is predicted significantly by: (a) tests that measure the landmark factors of Verbal Knowledge, Spontaneous Flexibility, Associational Fluency, Originality, and Ideational Fluency; and (b) several other measures including Aspiration in Communication Abilities, Self-Estimates of Expression and Writing Abilities, Broadly Diffused Attention, Verbal Originality, Negative Self-Report on Communication Traits (negative validity), Idea Listing Facility, and the three rate of talking scores. Other factorially complex scores from Revision II and Word Association were also valid measures of this criterion. This oral organization score is predicted by many variables which have a reasonable relationship to the task. It appears to be another complex type of activity, but one which can be predicted well by a combination of the test scores in this study.

C. Correlates with other criterion scores.

68 VII. Emergency Telephone	.70	75 XIV. Writing I	.39
62 III. Lecture--speaking	.70	77 XVI. Adm. Discip. Action	.37
58 I. Conference	.66	84 XVII. Written Interp.-idea	.34
80 Writing Organization	.45	74 XIII. Reading Compreh.	.32
59 II. Oral Reading	.41	61 III. Lecture--ideas/oral	.32
78 XVIII. Writing II	.40	76 XV. Editing	.30

The criterion correlates indicate that this score is related to other situational scores which primarily measure speaking and writing abilities and that it also has a low relationship with reading comprehension. The three highest correlations are spuriously high because of common subscores. The evidence indicates that this composite organizational score derived across three situations is quite complex.

Interpretation of a Higher Directive Situation XVII--Interest Score Correlates

Score 82 derived from situational test XVII measured the ability to interpret a directive from a higher source and write an

appropriate information bulletin for a group of subordinates.

A. Description of the scoring method. This score obtained by a subjective ranking measured the degree of interest contained in the new information bulletin.

B. Correlates with predictors.

86 Rate of Public Speaking	.30	45 Soc. Instit.--indirect	.27
5 First and Last Letters	.29		

The predictor correlates indicate that this score on the interest of a rewritten directive is predicted significantly, but not to a high degree, by: (a) tests that measure the landmark factor of Word Fluency; and (b) Rate of Public Speaking and the indirect responses on Social Institutions which had a loading on the Self-Estimate of Writing Ability factor found in Battery B. Apparently, the ability to give indirect, insightful, far-reaching responses is related to an ability to write an interesting directive. This interest score of the rewritten directive appears to measure primarily some variables that are not wholly accounted for in this study.

C. Correlates with other criterion scores.

78 XVIII. Writing II	.34	73 XII. Interview Listening	.29
80 Writing Organization	.30	62 III. Lecture--speaking	.25

The criterion correlates with this score offer more insight into its content than do the above predictor correlates. It correlates significantly with two writing scores, the interview listening score, and the lecture ability rating. The scores on three out of four of these correlates are based partly upon the interestingness of written and orally expressed material. Apparently very few of the 84 communication scores in Battery C measure an ability to express material in an interesting way.

Interpretation of a Higher Directive Situation XVII--Addition and Distortion Total Score Correlates

Score 83 derived from test XVII measured the tendency to distort the original facts and to add statements in the new writing that were not included in the original source.

A. Description of the scoring method. This total score was obtained by listing specific details appearing in the original writing and by comparing the examinee's new writing with this list. Any significant additions or distortions found in this material were counted to obtain the score.

B. Correlates with predictors.

49 Comp. Words II--sound	.35	5 First and Last Letters	.27
7 Similes I--total	.28	33 Word Assoc.--total	.24
38 Brick Uses--total	.27	85 Rate of Oral Reading	.23
		34 Word Assoc.--unpop	.22

The predictor correlates indicate that this addition and distortion score is predicted significantly by: (a) tests that measure the landmark factors of Ideational Fluency, Word Fluency, and Associational Fluency, and (b) The Rate of Oral Reading score plus the one other new predictor test which measures the ability to compound new words to express the meaning of given stimulus words when scored on the sound patterns of the newly created compound words. Some of these valid scores also measure Verbal Originality and Idea Listing Facility. It is reasonable to expect especially the addition part of this criterion score to be related to written fluency scores involving expansion from given stimulus words and contexts. It is difficult to explain why the sound pattern score on newly formed compounding words is positively related to this addition-distortion criterion score.

C. Correlates with other criterion scores.

76 XV. Editing -.24

The criterion correlates indicate only one significant correlate with this score. The editing score was related to it negatively, which is a very reasonable finding. In other words, an efficiency, accuracy score in an editing task is negatively related to the degree of addition and distortion in rewriting a message from higher headquarters.

Interpretation of a Higher Directive Situation XVIII--Idea Score Correlates

Score 84 derived from situational test XVII measured the number of ideas accurately presented in an information bulletin rewritten upon a higher directive to a group of subordinates.

A. Description of the scoring method. This total score was a summation of all of the ideas contained in the original directive which were presented clearly and accurately in the newly written information bulletin.

B. Correlates with predictors.



9 Plot Titles--high	.39	27 All-Round Ability--read	.23
45 Soc. Instit.--indirect	.35	6 Verbal Classification	.23
53 Outlining III	.30	85 Rate of Oral Reading	.23
10 Vocabulary	.28	31 Diff. Score--read	-.22
22 Revision II--words/idea-	.25	35 Word Assoc.--ave. qual.	.22
30 Diff. Score--write	-.24	48 Comp. Words II--total	.22
20 Revision II--ideas	.24		

The predictor correlates indicate that this transmission-of-given-ideas score is predicted significantly by: (a) tests that measure the landmark factors of Originality, Verbal Knowledge, and Verbal Classification; and (b) several of the new ability tests measuring Self-Estimate of Writing Ability, Aspiration in Communication Abilities, Verbal Originality, and the Rate of Oral Reading. Other factorially complex scores from Revision II, Outlining III, and Word Association are also valid predictors. From these data it appears that this task is adequately predicted by the tests in this study and that it is not as complex in terms of this set of predictors as are many of the other criterion scores. This vital type of activity can currently be predicted with enough accuracy to warrant application to military situations.

C. Correlates with other criterion scores.

81 Speaking Organization	.34	80 Writing Organization	.26
77 XVI. Adm. Discip. Action	.31	67 VI. Desig. Leader--status	.25
62 III. Lecture--speaking	.31		

The criterion correlates indicate that this score is related to a few other situational scores measuring writing organization, talking organization, lecturing ability, oral administration of disciplinary action, and communicative statements made in a designated leadership situation. It appears here that accuracy and carefulness of communication is related to effectiveness in boss-worker relations and in the organization of expressed materials.

Summary

The overall results for Battery C will be presented first in the form of brief summaries for each type of criterion score--namely, reading, listening, speaking, and writing. Following these summaries a few general observations on the entire study will be reported to conclude the chapter.

The first reading situation entailed the planning of an informative paper and involved the reading and organizing of a set of printed cards into an outline. As expected, all reading, note-taking, writing organization, outlining, editing, and revision

scores correlated significantly with this criterion as did some other writing scores and some self-report scores, including a listening one. Four of the five listening scores correlated significantly with this reading-and-planning score, which is surprising since the listening scores were not clustered closely to each other. The only talking criterion that correlated significantly was the ideas-delivered score in the lecture, which is a reasonable finding since idea reception and organization were involved in planning the informative paper.

One of the more predictable criteria was the Reading Comprehension situational test. Its correlates include nearly all of the reading types of scores, 16 writing, 9 self-report, 5 talking, and 1 listening score. Thus, the understanding of written material was related to a variety of non-reading types of scores.

There were three different listening criteria. The Control Tower Listening score was related to two of the four other listening scores (including two listening predictors scores), to self-reports on listening, reading, and writing ability and aspiration, and to a few writing tasks. The Identification of Sounds criterion was also related to two other listening scores, negatively to one self-report on talking aspiration, and negatively to two speaking criteria. These negative relations suggest that strong motivation toward listening and toward talking may be somewhat antagonistic processes at least in some persons, perhaps involving conflicting response sets that are fairly stable across different activities. The Interview Listening criterion had about an average number of correlates but, surprisingly, none of the eight test and self-reports listening scores were significantly related to it. The significant correlates included 13 writing, 4 reading, 2 self-report, and 2 talking scores.

The conference was the first speaking situation. Some of the main characteristics needed in the conference are flexibility, ability to outline, revise, and organize materials, ability to make far-reaching observations, ability to transmit and implement a directive, talking and instruction abilities, and leadership of both the designated and emergent types.

Oral reading skill is related to and perhaps dependent upon many abilities of reading, talking, and writing types; in fact, oral reading was the extreme case among Battery C criteria since quite unexpectedly it had the largest total number of correlates, namely 45 out of a possible 83. Thus oral reading has a generality not usually found in communication skills in its large number and wide variety of correlates.

The factual data score on information presented in the Classroom Lecture was highly related (largely due to experimental dependence) to the note-taking score in the preparation for the lecture and consequently had essentially the same types of correlates with negative and positive self-reports being correlated in the expected direction. In addition, the score on the factual data transmitted had a low positive relation with the talking ability score on the lecture; however, these two scores were not experimentally independent, so the true relation between facts delivered and rating on talking ability would probably be lower than the obtained relation and may at most be barely significant.

The rating on speaking ability derived from the Classroom Lecture had more correlates than any other criterion score except oral reading and was essentially tied with the Writing I, Writing II, and Writing Organization overall scores. Self-reports of both negative and positive types, revision, vocabulary, outlining, skimming, and certain fluency and flexibility scores were the main test scores that by indirect means predicted this public speaking ability. Two thirds of the criteria correlated with public speaking ability including one listening, one reading, seven writing, and eight talking criteria.

One set of correlates with the public speaking ability score is of unusual interest. The need-for-affiliation -- a striving for status score -- and the lie score correlated positively along with the number of facts actually presented in the speech; but a writing aspiration score, and the number of given ideas transmitted in a telegram, correlated negatively with this speaking ability score. In summary, public speaking ability can be predicted quite well from its wide variety of correlates, but some of its unusual correlates strike a note of caution about the messages and especially the motivation of some of those with high ratings on speaking ability.

The distortion score in the Classroom Lecture had only 1 significant correlate out of 83. However, there were only a couple of scores resembling this distortion talking score, but they were either of the self-report or written expression type. In order to get a distortion score with greater variance that is predictable, it may be necessary to build a crucial situational test where one's status is truly at stake and where there is some real incentive to distort.

The error criterion score in the Classroom Lecture had only four correlates, all of them negative: two reading, one listening, and one self-report type of score. There were very few error type

of scores in Battery C, a fact which may account for the relative lack of significant correlates.

The instruction-on-the-job criterion correlated with self-reports, writing aspiration, vocabulary, revision, and three talking criteria. It also correlated negatively with the listening criterion pertaining to the identification of sounds. Thus, it correlated with one writing, one reading, one listening, five self-report, and three talking scores, so that its few correlates collectively spanned a wide area.

The Emergent Leadership criterion had only three correlates, all of which were talking criteria, so it was not very predictable and correlated only with three criteria which had very similar features in common.

Performance in the Designated Leadership situation had a few correlates of writing, talking, and self-report types. The ability to see far-reaching changes that are needed and self-reports on talking characteristics were the best predictors. Contrary to expectations, the need-for-status predictor was valid for the total score in the Designated Leadership situation but correlated zero with the special status score derived from the same situation. This special status criterion score had only four correlates: one self-report on speaking ability, one writing score, one talking criterion, and one writing criterion. Thus, its four correlates were of four widely different types.

The Emergency Telephone Action criterion had an above-average number of correlates, consisting mainly of reading and writing predictors and talking and writing criteria. Only one listening score correlated significantly, although the task included several conversations on the phone. Since these were emergency conversations with the examinee mainly delivering an emergency message, this listening portion was of minor importance. Reading came in quite heavily because the examinee had to read and refer to several written materials as he fulfilled his tasks.

The criterion scores in the Disciplinary Action situation were related primarily to self-report and writing predictors and to talking and writing criteria. Unexpectedly, the writing self-reports were better predictors of this oral performance than the talking self-reports.

The results for the Speaking Organization composite score resemble those for Writing Organization since numerous writing and self-report scores but no listening scores were related. Several talking criteria also correlated with Speaking Organization. The best



predictors included such expected types of scores as outlining, revision, vocabulary, and skimming. All of the aspiration and most of the all-round ability self-reports were valid predictors.

The first score from a writing situation required note-taking preparation preceding the lecture situation. According to its correlates, this writing task involved reading, writing, editing, outlining, and organizing skills and a good vocabulary and some fluency abilities.

The written exposition from the outline of information on cards had an average number of correlates of reading, self-report, writing, and talking types. Its highest correlates were generally expected, consisting of the Writing I and II criteria, vocabulary, reading comprehension and oral reading.

The Writing I and the Writing II criteria had a similar profile across types of scores. They correlated mostly with writing scores, with many self-report scores, and with a few reading scores. The Editing criterion showed similar results except for the fact that fewer self-report scores were significantly related to this criterion. With two exceptions, scores on listening tests did not correlate with these three complex writing scores.

The Writing Organization score, which was a composite score derived from two situations, correlated with half of the scores in Battery C. Many writing scores, practically all reading scores, several talking scores, but no listening scores were correlated with Writing Organization. Some of its highest predictors were self-reports on all four aspiration scores and on all four all-round ability scores. Practically every writing criterion correlated significantly, so that one can conclude that organization is fundamental in writing tasks and is related to organization in public speaking and also to most reading scores.

The interest criterion score from the Interpretation of a Higher Directive situation had only six correlates: two writing predictors, two writing criteria, the Interview Listening criterion, and the public speaking ability rating in the Classroom Lecture. Apparently interestingness of expression is not measured by most of these predictors and appears in only a few of the criteria, especially where interest was part of the scoring system. The addition and distortion score from the same situation was positively predicted by Ideational Fluency, Word Fluency, and Associational Fluency scores and was negatively related to the Editing criterion score, where precision in reduction rather than fluency regardless of quality is involved. It is reasonable that in fluency tests calling for expansion from given materials without strong quality



requirements, additions and some distortions would tend to occur. The other correlate is also noteworthy. Some of those who score high on the sound characteristics of their newly created compound words probably focus their attention on the sound patterns and to some degree may not attend as closely to the semantic accuracy of their newly formed words. That is, they may modify (distort) their new word as they are forming it to move somewhat away from semantic requirements toward satisfying sound-pattern requirements.

Ghiselin, wrote the following special passage about his Compound Words test at the end of the project:

The fact that an ability to invent pleasing sound in making new compound words correlates significantly with a tendency to add to and to distort the given material in the process of passing on information is perhaps explicable to some extent on the basis of the idea that both "tasks" represent an escape from the tyrannous inflexibility of media and matter in workaday communication. The subject who by invention escapes using whatever unprepossessing gabble practical intent and usage may entail is the same subject who escapes the boredom of simply repeating the substance of a body of thought with which he is already acquainted. Or, in other words, the subject achieves euphony and variety in his communication through transcending the plain convention and the plain fact: The "truth" suffers, but there is a gain: in the direction of beauty. Now this is just what the poet achieves, or what to less imaginative people he appears to achieve: he lies beautifully. And this is perhaps the main reason for a flaw in his reputation--why some people are prone to think his behavior absurd. As Albert Camus asserts, "the joy of absurdity par excellence is creation," and he cites in support of his idea Nietzsche's saying that " 'We have art in order that we may not die of the truth.' " Thus the addition and distortion score may be an index of a creative tendency.

The ideas-transmitted score on the Interpretation of a Higher Directive situation had several correlates of each type except listening. The types of scores with highest relations include a cleverness score, a far-reaching changes score, revision, and organizing scores. It is interesting that the persons who made more

status seeking remarks during the Designated Leadership task also transmitted a larger percent of the given ideas in their rewriting of the directive from higher headquarters. Paradoxically this written transmission of ideas score was related to public speaking effectiveness but not to the idea transmission score in the Classroom Lecture situation.

In addition to the above summary of the validity results, a few general observations should be made about the set of predictors and the set of criteria in Battery C. The existing tests which were selected as the best and most relevant tests from many previous factorial studies proved to be slightly better predictors on the average than did the new tests which were first developed and used in this project. Scores on the new ability and new personality tests were approximately equally good as predictors in Battery C. It should be mentioned, however, in qualification of these general observations, that some of the existing tests were very poor predictors of communication skills, whereas some of the new ability and new personality scores were among the best predictors in the battery.

Similarly there was considerable overlap between the relatively complex and the relatively simple test scores, in terms of their number of significant validities. As would be expected from their hodgepodge nature, the relatively complex scores were valid for an average of nearly two more criteria than were the relatively simple scores. Similarly, the more complex criteria overlapped other scores in Battery C more than did the less complex criteria.

Predictor tests with multiple scores averaged a smaller number of significant validities per score than did tests with single scores. This was somewhat expected, since two or more scores per test were developed whenever possible because of the relative economy of extra scores as well as the interest in them. The results are about equal when the single best scores for the multiple-scored tests were compared with the scores for single-scored tests. This suggests that a combination score for the multiple-scored tests would have predicted better, on the average, than scores from single-scored tests, especially if the combination were best weighted, in turn, for each of the criteria. Overall, the recommendation is to use multiple scores per test where feasible. Challenging questions about what is measured in scores also arise when some of these unusual second and third scores for a test show little overlap with traditional types of scores for the same test.

Variable results were obtained in the few instances where ratio scores were tried. For example, the ratio score on Revision II was valid for more criteria than any other predictor score in the

battery, whereas the ratio score on telegram writing tasks showed relatively few correlates in any of the three studies.

Although there were not many scores in Battery C where the examinee had been told to stress quality and accuracy and where he also had been given a little extra time to attain quality in his responses, these few scores did correlate fairly well with other scores in the battery. It is a notable fact that quality scoring of responses on predictor tests yielded at least as good results as quantity scoring, so there should be no hesitation hereafter to get quality scores from communication tasks, even when scoring methods that are somewhat subjective must be used.

Some of the other new interesting scoring systems which were devised for certain of the predictor tests failed to predict well in Battery C. The main reason probably was that scores of their types were not derived from any of the situational criterion tests, so they did not have pertinent criteria "to hit." It now seems clear that more scores with greater variations in types of criterion scores should have been obtained from the complex situational test performances, in order to permit all relationships with the predictor scores to emerge.

It is interesting to compare the role of fluency of ideas, expressions, words, and associations in expanded communications. According to the information to date, quantity of associations is the most important; quantity of word production is unexpectedly second; quantity of ideas is third; and quantity of expressions ranks fourth. This conclusion is based upon the relative effectiveness of the four fluency factors in predicting the entire set of communication skills in the Battery C situational tests.

The predictors involving reduced expression had a considerably higher number of significant validities than the predictors involving expanded expression, even though more criteria called for expanded than for reduced expression. Yet the reduced expression scores showed little in the way of organized clustering with each other. In retrospect, it has been evident that the largest number of criterion scores tested the examinee's efficiency in transmitting given messages rather than in expanding or reducing them. Since efficiency-of-transmission tests were unfortunately not included to any degree in the predictor batteries, these criteria which stressed sheer transmitting of messages had a below average number of valid predictors.

Most of the expressional tasks did not allow much time for lengthy thought before writing or stating one's thoughts. A few of the tests such as Telegram Writing, Revision, and Editing allowed

a little time to get organized before writing. Two of the areas not particularly covered by the project include the ability to think things through quite thoroughly before expressing oneself and the "timeliness" ability to withhold one's own thoughts or a given message until the most strategic time for expressing them. These are two tremendously important areas in communication but their internal subjective nature makes them difficult areas in which to obtain reliable and valid data.

In comparing the four main types of criteria--namely the reading, listening, speaking, and writing types--it was found that the reading criteria correlated on the average with over 24 predictors and with 11 other criteria. The writing criteria had significant correlations with an average of 17 predictors and 9 other criteria. The speaking criteria correlated with an average of 11 predictor and 3 other criterion correlates. In view of the emphasis on writing predictors and on talking criteria in Battery C, it was very surprising that the reading criteria had the most correlates in the Battery, especially when it is recalled that there were only three reading predictor scores and only two reading criteria. The number of listening predictors and criteria was about the same as for reading. Yet listening criteria had the fewest correlates. The results were consistent across both predictors and criteria, so that in each case the types ranked in the order of reading, writing, speaking, and listening, according to their average number of correlates.

The entire set of criteria considered collectively gives a somewhat representative sample of the total domain of communication skills in military situations. Because some predictors were valid for the majority of the criteria, it would be quite easy to identify a general battery of a few scores that predicted nearly all criterion scores in Battery C to at least a minimum significant level. For example, one or more of the scores from a comparatively short battery of Revision II, All-Round Ability Scales, Word Association, and Social Institutions significantly predicted 24 out of 27 criterion scores in Battery C. Other combinations of predictor scores would form general batteries almost equally efficient.

Each criterion should be viewed as being entirely separate from the remaining criteria for multiple correlation purposes. Considering each criterion as a separate unit, the distribution of the highest single validity coefficients per criterion shows one in the .70's, one in the .60's, eight in the .50's, three in the .40's, ten in the .30's, and four in the .20's. It is estimated that at least half of the criteria would yield a multiple correlation in at least one class interval higher than those just reported for the single highest validity. Therefore, with only a couple of



exceptions, an efficient battery could be developed separately for each of the 27 criteria. Two doctoral dissertations were written with the preparation of these batteries as the objectives (Cochran, 1959; Smith, 1960). A brief reporting of their findings together with the results of more extensive multiple correlation work will be presented in the next chapter.

If differential prediction of the criteria should be desired, it would be readily possible to select a battery of test scores for this purpose. The wide and varied scatter of significant correlations in the validity section of the Battery C correlation matrix makes possible fairly effective differential scoring across a reduced battery of predictors. To take a good specific example, Outlining III scores predicted Conference criterion scores with a validity of .52, whereas Vocabulary scores failed to predict this criterion; and the reverse was true for Written Exposition criterion scores, for which Outlining III scores were not valid, but Vocabulary scores had a validity of .50. Other similar combinations of valid and non-valid predictors can be found for the majority of pairs of criterion scores.

Admittedly cross validation studies have not yet been done and would, of course, be desirable as a check on the Battery C findings. Such studies might be accomplished while implementing the findings to date.



## CHAPTER XII

### PREDICTIONS BY MULTIPLE CORRELATION

A main question to be examined here is the predictability of each of the criteria. It was noted that the criteria were, for the most part, composed of a combination of many simple behaviors into a complex whole rather than a single simple behavior. The complexity in the communication tasks is borne out especially in the factor studies and correlations.

In view of the multidimensional nature of the criterion situations, single predictors of these performances by themselves could not be expected to yield very accurate predictions. The use of multiple correlation techniques for obtaining best weighted combinations of test scores lends itself nicely to the problem here.

Prediction by four or fewer test scores. In the beginning of this exploratory research program, computers with capacities large enough to accommodate the data and analyze them in the ways desired were not readily available. Simple multiple correlation procedures were therefore employed with only a small battery of test scores to predict each criterion. The procedure was merely to list in order the tests with the highest validity coefficients for each situational criterion score. The four most valid tests for each criterion were selected as the "best" battery for each criterion and multiple correlation coefficients for each battery were then determined. Only three or less predictor correlates were used in cases where fewer than four significant correlations were available. These analyses are covered in more detail by two doctoral dissertations, and the reader is referred to them for more complete information (Cochran, 1959; Smith, 1960).

Smith (1960) dealt with eleven reading and writing criteria and three speaking criteria--a total of 14 criterion variables. For one of these situations a test battery was not selected, inasmuch as there were no significant predictor correlates. The multiple correlations were computed for a short test battery for each of the remaining 13 selected criterion scores. The range of multiple correlation coefficients was from a low of .32 to a high of .77, all of which are significant at or beyond the .01 level. In the other dissertation Cochran (1959) dealt with the 13 speaking and listening criteria. The same system as Smith used for selecting the four (or fewer) "best" significant correlates in computing the multiple correlation was followed. In this case the multiple correlation coefficients ranged from .35 to .71, all of which are significant beyond the .01 level. The criteria, their respective

selected batteries, and the multiple correlations as well as other relevant data from these two studies are combined and presented in Table 50 in Appendix III. The findings from each respective study are also indicated in this table.

The results of these analyses yielded 26 different batteries of tests--one for each of the 26 predicted criterion situations. Each battery consisted of four tests or less. If one were looking for an individual to perform a particular communication task, he could select a particular short battery of tests to use.

Prediction by larger batteries of test scores. We are very much aware that all multiple correlations in this chapter are initial ones not corrected by statistical procedures nor checked by cross validation studies. We have not yet had a chance to cross validate although in our research projects, we attempt to cross-validate whenever possible; for example, in our many biographical studies we usually no longer even report initial validities, but only cross validities.

If the problem is that of placement, then it is not likely that administering all 26 short batteries described above would be appropriate. An alternate approach then is to attempt to select one larger battery from which to predict all 27 criterion scores.

Following these earlier studies, computers with capacities large enough to handle larger batteries in our problems became available. For multiple correlation computations it became possible to assemble a much larger battery of tests which would increase predictive effectiveness. In planning these analyses, the question arose about the cost and difficulty of scoring some of the tests. A fraction were machine scorable; another fraction of the remaining scores were easily and readily scorable by hand; and the remaining scores required considerable time and expert judgment on the part of scorers. The question arose as to the loss of efficiency in prediction through imposing each of two restrictions on the scoring ability of the predictor tests considered in the computation of the multiple correlations.

Before these analyses were started, 9 of the 60 predictor scores were dropped because all of their correlations with the criteria were low (about .20 or less). To determine the loss in efficiency of prediction entailed by imposing certain restrictions on the scoring of predictor tests, three sets of multiple correlations for each of the 27 criterion scores in Battery C were computed. These three analyses permit a check on whether decisions to use "practical" approaches are as sound as they may appear to be on the surface.

The three sets of scores used in the multiple correlation comparisons are as follows:

1. In the first set there was no restriction on the nature of the predictor variables, so that all of the remaining 51 of the original 60 test scores were used.
2. In the second set, the one new restriction was that the predictor scores must be easily obtained, either by hand or by machine. The requirement that scoring be easy was met by 35 of the 51 variables.
3. The third set had the further restriction that all of the predictors had to be scorable by machine. The 24 predictor scores which met this machine-scorable requirement were used in the third analysis.

Table 38 shows the three lists of these 51, 35, and 24 scores. As seen at the bottom of the lists, the total number of tests required to yield each battery of scores are 25, 17, and 10 tests and the total testing times are approximately 125 minutes, 88 minutes, and 57 minutes, respectively. This table also lists the identification number of all test scores used in one or more of the 26 short batteries chosen by Cochran (1959) and Smith (1960). The frequency with which each score was used in their 26 batteries is shown in parentheses with the first number indicating those used by Cochran and the second showing those selected by Smith. All of the 25 tests and all but 11 of the 51 scores entered into one or more of their short batteries. Thus, in one sense their total battery was a long one of 40 scores derived from the same 25 tests requiring 125 minutes, but they only selected a particular set of four or less scores for each criterion. See Table 50 in Appendix III for the different subset of scores used by Cochran and Smith for each different criterion. Since all 25 tests are required in one or more of the 26 batteries of Cochran and Smith the total testing time would be the maximum amount required to administer all the tests in Battery C, which is quite an expensive undertaking. The 26 Cochran and Smith short batteries would require 40 scores extracted from the 25 different tests. It should be noted that no consideration was given to the method of scoring in selecting the tests that went into each of their short batteries.

For the 27 criteria, the multiple correlation coefficients under these three different scoring conditions as well as for the four or fewer tests per battery by Cochran and Smith are shown in Table 39. An examination of the data shows that the largest coefficients, as expected, were always obtained with 51 predictors where the range of multiple correlation coefficients were from .71 to .93, with a

Table 38

## FOUR SETS OF PREDICTORS USED IN MULTIPLE CORRELATIONS WITH 27 CRITERIA

Predictor Scores	Test Score Numbers			
	Cochran and Smith 4 or less scores/crit.	51 Scores-- All Scores	35 Scores-- Easily Scored	24 Scores-- Machine Scored
Satis. Ability--speak	1 (2-1)	1	1	1
Satis. Ability--write	2 (1-1)	2	2	2
Satis. Ability--read	3 (2-1)	3	3	3
Satis. Ability--listen	4 (0-1)	4	4	4
Verbal Classification	6 (1-0)	6	6	6
Vocabulary	10 (1-2)	10	10	10
Spch. Snd. Discrim.	13 (0-1)	13	13	13
Auditory Retention	14 (1-4)	14	14	14
All-Round Ability--speak	25 (1-1)	25	25	25
All-Round Ability--write	26 (0-0)	26	26	26
All-Round Ability--read	27 (1-0)	27	27	27
All-Round Ability--listen	28 (2-0)	28	28	28
Diff. Score--speak	29 (1-0)	29	29	29
Diff. Score--write	30 (2-0)	30	30	30
Diff. Score--read	31 (0-1)	31	31	31
Diff. Score--listen	32 (0-0)	32	32	32
Phrase Check List--pos.	39 (0-1)	39	39	39
Phrase Check List--neg.	40 (2-1)	40	40	40
Comp. Words II--total	48 (2-0)	48	48	48
Skimming	52 (1-1)	52	52	52
Biog. Info.--speak	54 (1-1)	54	54	54
Biog. Info.--write	55 (0-0)	55	55	55
Biog. Info.--read	56 (1-0)	56	56	56
Biog. Info.--listen	57 (0-0)	57	57	57
First and Last Letters	5 (0-4)	5	5	5
Similes I--total	7 (0-1)	7	7	7
Topics--Quantity	11 (2-0)	11	11	11
Letter Star II--1st resp.	18 (1-1)	18	18	18
Letter Star II--2 & 3 resp.	19 (0-2)	19	19	19
Word Assoc.--total	33 (0-1)	33	33	33
Brick Uses--total	38 (1-0)	38	38	38
Outlining III	53 (4-2)	53	53	53
*Rate of Oral Reading	85 (0-0)	85	85	85
*Rate of Oral Speaking	86 (0-0)	86	86	86
*Seconds Pauses/minute speaking	87 (0-0)	87	87	87
Plot Titles--clever	9 (0-1)	9	9	9
Telegram III--ideas	15 (1-0)	15	15	15
Telegram III--words	16 (0-1)	16	16	16
Revision II--ideas	20 (1-3)	20	20	20
Revision II--words	21 (0-0)	21	21	21
Revision II--words/idea	22 (1-2)	22	22	22
Similes I--high	23 (0-0)	23	23	23
Similes I--high	24 (0-0)	24	24	24
Word Assoc.--unpop.	34 (4-2)	34	34	34
Word Assoc.--Ave. qual.	35 (0-0)	35	35	35
Brick Uses--Categ. chgs	37 (4-0)	37	37	37
Test of Insight--status	42 (0-1)	42	42	42
Soc. Instit.--indirect	45 (5-5)	45	45	45
Qual. of Super. Spkr.	47 (1-0)	47	47	47
Comp. Words II--sound	49 (0-1)	49	49	49
PE Scale--anxiety	50 (1-0)	50	50	50
TOTAL NUMBER OF TESTS	25 tests	25 tests	17 tests	10 tests
TOTAL TESTING TIME	125 mins.	125 mins.	88 mins.	57 mins.

\*These 3 scores derived late in the project from situational tests are excluded from the summary of the number of tests and total testing time required.



Table 39

MULTIPLE CORRELATIONS FROM FOUR DIFFERENT BATTERIES  
IN PREDICTING THE 27 CRITERIA

No.	Criterion Score	Number of Scores							
		51 R	35 R	24 R	C&S* R	51 R <sup>2</sup>	35 R <sup>2</sup>	24 R <sup>2</sup>	C&S R <sup>2</sup>
58	I. Conference	87	80	51	60	76	64	26	36
59	II. Oral Reading	93	83	75	71	86	69	56	50
60	III. Lecture--ideas/notes	83	71	64	47	69	50	41	22
61	III. Lecture--ideas/oral	88	78	71	58	77	61	50	34
62	III. Lecture--speaking	86	79	67	65	74	62	45	42
63	III. Lecture--distortion	79	71	52	35	62	50	27	12
79	III. Lecture--errors	77	69	62	40	59	48	38	16
64	IV. Instruct. On-the-Job	81	65	57	41	66	42	32	17
65	V. Emergent Leader	71	56	45	--	50	31	20	--
66	VI. Desig. Leader--total	86	75	61	45	74	56	37	20
67	VI. Desig. Leader--status	83	71	57	32	69	50	32	10
68	VII. Emergency Telephone	83	75	59	54	69	56	35	29
69	VIII. Plan. Inform. Paper	91	82	74	62	83	67	55	38
70	IX. Written Exposition	83	70	66	55	69	49	44	30
71	X. Control Tower Listening	90	83	71	60	81	69	50	36
72	XI. Identification of Snads.	76	66	57	41	58	44	32	17
73	XII. Interview Listening	78	69	58	49	61	48	34	24
74	XIII. Reading Compreh.	89	84	80	69	79	71	64	48
75	XIV. Writing I	92	84	80	77	85	71	64	59
76	XV. Editing	85	74	61	58	72	55	37	34
77	XVI. Admin. Discip. Action	79	72	60	49	62	52	36	24
82	XVII. Written Interp.--int.	76	69	49	37	58	48	24	14
83	XVII. Written Interp.--dis.	82	70	48	44	67	49	23	19
84	XVII. Written Interp.--ideas	84	75	62	58	71	56	38	34
78	XVIII. Writing II	88	84	73	70	77	31	53	49
80	Writing Organization	87	80	66	69	76	64	44	48
81	Speaking Organization	89	81	64	65	79	66	41	42
	MEDIAN	84	75	62	57				
	(MEDIAN) <sup>2</sup>					71	56	38	32

\*Cochran and Smith--4 (or less) scores per criterion



median of 84. The range of coefficients for the 35 predictor scores was from .56 to .84, with a median of .75. The 24 predictor scores yielded coefficients ranging from .45 to .80 with a median of .62. The obvious trend, as known in advance, was for the greatest number of predictors to yield the highest coefficients. The main question was how much loss in predictive efficiency would occur when "practical" restrictions were placed on the battery as far as scoring (and testing time, too) were concerned. The coefficients obtained by Cochran and Smith are also listed for easy comparisons. Their 26 multiple correlations (with only 4 or less predictors each) ranged from .32 to .77, with a median of 56.5.

Table 39 also shows the multiple correlations squared ( $R^2$ ) in a separate set of four columns. These values are presented for easy comparison in terms of percentage of the variance of each criterion that is overlapped by each predictor battery.

These results permit a type of input-output analysis--a comparison of the cost of battery versus the validity level returns for each length of battery. If the findings for these three longer batteries are compared with those of Cochran and Smith mentioned earlier, greater predictability with more predictors was found, as expected. This is the case even when one of their "best" test scores was excluded from the larger battery of tests. The multiple correlation coefficients ( $R$ 's) for the 24 predictor battery are, on the average, about .10 points higher than for the Cochran and Smith batteries. Nevertheless, for almost half of the criteria, the smaller 4 score battery predicts nearly as well as the larger 24 score battery.

If we compare the results for the 25 versus 35 versus 51 score batteries, the multiple correlations are, of course, increasing. The questions were what the relative magnitudes of the increases were and which ones of the increases were worth the cost.

Inspection of Table 39 shows that there is some loss in reducing from 51 to 35 predictor scores as a result of deciding not to use the predictors which were most difficult and costly to score. The loss, however, may generally not be too unbearable. There is almost as great a loss, if not a greater loss (in terms of  $R^2$  comparisons), in going from the easily-hand and machine-scored to the machine-scored-only requirement yielding 24 scores. Consequently, it could be argued strongly that both machine scored and other easily scored tests should be used if at all possible because of the remarkably good returns from this combination. Then one would have to decide which criteria are sufficiently important to warrant the extra increase in validity (where such increases are customarily so hard to gain) that would be possible by paying the extra price

required to obtain the additional 16 more difficult and costly scores. Admittedly the criterion scores are costly to obtain and to a considerable degree are subjective in nature. If a battery of predictor scores is desired which largely parallels the criterion scores, then a portion of the predictor scores might have to be largely subjective and more costly to obtain, at least until more psychological measurement capabilities are available than now exist.

Table 40 was set up to more sharply and precisely make the comparisons between the four different types of batteries. Six columns of ratios of  $R^2$ 's are shown in this table. The first column shows for each criterion the ratio of  $R^2$  for the 51 score battery to  $R^2$  for the 35 score battery. Inspection of this column indicates that, in general, a noticeable increase in validity (as judged by an increase in criterion variance overlapped) occurs in practically every instance. The greatest percentage increases were for the Emergent Leader and the Instruction On-the-Job criterion scores. The least increase occurred for the Writing II situation and the Reading Comprehension situation which implies that the types of tests on which the most measurement work has already been done (including work on simplified scoring) are those tests which get at such academic activities as reading comprehension and theme writing.

The average increase was about 25% gain in criterion variance overlap (a ratio of 1.25) when one increases the battery requirement about 50%--that is, from 35 to 51 scores, from 17 to 25 tests, and from 88 to 125 minutes. On this point one should be cautious before making quick judgments, because this 25% gain in variance overlap may be a great gain inasmuch as it may represent reaching into criterion areas that are usually most difficult to overlap. So this difficult-to-gain increase may be worth the extra price, especially if it enables fruitful work in a heretofore untouched area which may lead to improved and/or less costly testing devices.

The second column shows the ratio of the  $R^2$  for the 51 score batteries to the  $R^2$  for the 25 score batteries. Here an even greater gain in percentage overlapped occurs by more than doubling the battery requirements from 24 to 51 scores, from 10 to 25 tests, and from 57 to 125 minutes. The ratio of 1.83 indicates an average gain of 83% more criterion variance overlapped. The increase ranged from a high of 2.91 for the Conference situational score and for the distortion score in the situation calling for a Written Interpretation of Higher Directive to a low of 1.23 and 1.32 for the Reading Comprehension and Writing I criterion scores.

The greatest gains of all are obviously obtained by comparing the battery of 51 scores with the Cochran and Smith batteries of 4 or less scores each. Here the total costs per battery in number of

Table 40

RATIOS OF SQUARED MULTIPLE CORRELATIONS FROM FOUR DIFFERENT  
BATTERIES IN PREDICTING THE 27 CRITERIA

<u>No.</u>	<u>Criterion Score</u>	<u>51/ 35</u>	<u>51/ 24</u>	<u>51/ C&amp;S</u>	<u>35/ 21</u>	<u>35/ C&amp;S</u>	<u>24/ C&amp;S</u>
58	I. Conference	1.18	2.91	2.10	2.46	1.77	.72
59	II. Oral Reading	1.25	1.53	1.71	1.22	1.36	1.11
60	III. Lecture--ideas/notes	1.36	1.68	3.11	1.23	2.28	1.85
61	III. Lecture--ideas/oral	1.27	1.53	2.30	1.20	1.80	1.49
62	III. Lecture--speaking	1.18	1.64	1.75	1.39	1.47	1.06
63	III. Lecture--distortion	1.23	2.30	5.09	1.86	4.11	2.20
79	III. Lecture--errors	1.24	1.54	3.70	1.23	2.97	2.40
64	IV. Instruct. On-the-Job	1.55	2.00	3.90	1.30	2.51	1.93
65	V. Emergent Leader	1.60	2.48	--	1.54	--	--
66	VI. Desig. Leader--total	1.31	1.98	3.65	1.51	2.77	1.83
67	VI. Desig. Leader--status	1.36	2.12	6.72	1.55	4.92	3.17
68	VII. Emergency Telephone	1.22	1.97	2.36	1.61	1.92	1.19
69	VIII. Plan. Inform. Paper	1.23	1.51	2.15	1.22	1.74	1.42
70	IX. Written Exposition	1.40	1.58	2.27	1.12	1.61	1.44
71	X. Control Tower Listening	1.17	1.60	2.25	1.36	1.91	1.40
72	XI. Identification of Snds.	1.32	1.77	3.43	1.34	2.59	1.93
73	XII. Interview Listening	1.27	1.80	2.53	1.41	1.98	1.40
74	XIII. Reading Compreh.	1.12	1.23	1.66	1.10	1.48	1.34
75	XIV. Writing I	1.19	1.32	1.42	1.10	1.19	1.07
76	XV. Ed'ing	1.31	1.94	2.14	1.47	1.62	1.20
77	XVI. Admin. Discip. Action	1.20	1.73	2.59	1.44	2.15	1.49
82	XVII. Written Interp.--int.	1.21	2.40	4.21	1.98	3.47	1.75
83	XVII. Written Interp.--dis.	1.37	2.91	3.47	2.12	2.53	1.19
84	XVII. Written Interp.--ideas	1.25	1.83	2.09	1.46	1.67	1.14
78	XVIII. Writing II	1.09	1.45	1.58	1.32	1.44	1.08
80	Writing Organization	1.18	1.73	1.58	1.46	1.34	.91
81	Speaking Organization	1.20	1.93	1.87	1.60	1.55	.96
	(MEDIAN) <sup>2</sup> / (MEDIAN) <sup>2</sup>	1.26	1.86	2.21	1.47	1.75	1.19

tests and testing time were equal, though the scoring costs were slightly greater for the 51 score battery than for the collective 40 scores needed in the 26 short Cochran and Smith batteries. On the average, the criterion variance overlap more than doubled (an index of 2.21) for the 51 score battery, which illustrates clearly the power available and returns possible if one has the full capabilities of our latest computers available for use.

The fourth column shows the comparison of the easily-scored battery of 35 scores and the machine-scored battery of 21 scores. The average index of 1.46 (a gain of 46% criterion variance overlapped) suggests that the 14 additional scores can be worth the price, since the costs of these 14 scores comes from administering only 7 more tests for 31 more minutes plus the easy hand scoring required. One can look further into Table 38 for details as to where it would especially prove to be profitable to use the extra scores in the longer battery.

The gain across the three sizes of batteries (24, 35, and 51 scores) was greatest in case of the Conference situational score and the distortion score on the Written Interpretation of a Higher Directive. Other criteria with potentially greatest gains in sequence were: the Emergent Leader score, the interest score on the Written Interpretation of a Higher Directive, the distortion score in the Lecture situation, the status score in the Designated Leadership situation, the Instruction On-the-Job score, the total scores on the Emergency Telephone and Editing situations, and the Speaking Organization score.

Figure 1 was plotted to show the comparisons and the degree of steepness of this trend across batteries by arranging the sequence of the criteria on the basis of the magnitude of the multiple correlation results for the largest set of 51 scores. So that variances can be the basis of comparison, the multiple correlations have been squared in this charting. (For those interested, the multiple correlation coefficient not squared can be read along the vertical axis at the right.) The coefficients obtained by Cochran and Smith are also added for easy comparisons. The four curves are obviously roughly parallel, illustrating the greater accuracy in prediction with more test scores per battery. It can also be seen in Figure 1 that the results yielded by the small sub-batteries of about 4 scores each by Cochran and Smith are far below those yielded in the top line of Figure 1 which can be obtained by scoring and using every 51 scores of the entire battery of 25 tests which Cochran and Smith would have had to administer. In any event, the entire Figure 1 shows the total returns that can be obtained by using computer techniques now available that were not yet present in good



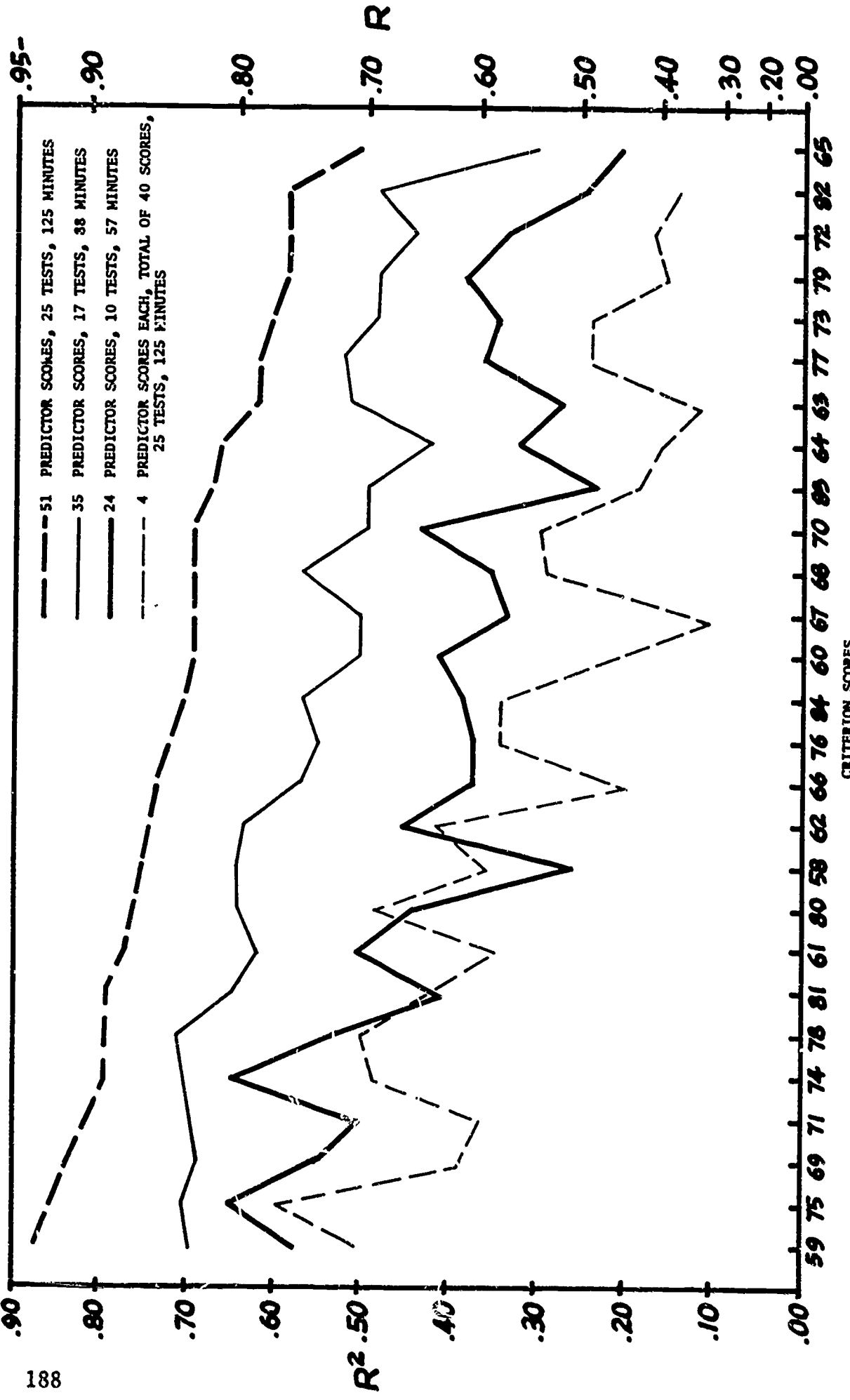


Figure 1: PROFILE OF SQUARED MULTIPLE CORRELATIONS FOR EACH OF FOUR BATTERIES



working order for use by Cochran and Smith. For practical reasons they had to limit their batteries to about 4 scores each and with these restrictions, in only three cases out of 27 were they able to obtain at least equally good batteries to what was obtained by the efficiently machine-scored batteries of 24 scores which required much less scoring effort and testing time than did their total battery.

If Figure 1 were rearranged so that the criteria were placed in descending order according to their predictability by the smaller 24 score battery (instead of the 51 score battery), a baseline would emerge, above which gains could occur by use of more complex scoring methods. Figure 1 as currently presented shows a somewhat different picture, namely, the ceiling from which one can drop by shrinking the set of scores to those using only the more simplified and economical scoring techniques.

In evaluating "efficiency," then, it is possible to consider the degree of predictability, the number of tests, the scorability, and the convenience of certain administrative procedures. The efficiency problem seems to depend on whether the task is to forecast a single criterion, i.e., the problem of specific selection (as was the focus in the case of both Cochran and Smith) or to forecast a large set of different criteria from one single battery of test scores (often called differential prediction or classification or placement), as has been the case in the three batteries here containing 24, 35, and 51 scores.

One of the by-products of this work is a multiple correlation computer program which will handle up to 55 predictor scores and up to 55 criteria with an unlimited number of subjects. The computer program is extremely versatile, so that it can perform several kinds of problems simply by indication on a control card. For example, it is possible to read in best (beta) weights on predictor tests from a previous sample of subjects and apply them to standard scores on a new sample to get predicted criterion scores, a very handy technique for use in cross validation work.

In this chapter it has been possible as a result of increased computer capability to perform these interesting battery comparisons in terms of testing time and scoring costs versus yield in multiple forecasting efficiency. Anyone responsible for an operational testing program could make better decisions on selection of batteries of test scores on the basis of these results (or on the basis of a similar pattern of results obtained for other batteries of tests). The decision can be based on what was most practical to use when both input costs and output yield are considered, instead of

deciding merely on the input basis of costs in testing time and in scoring of the tests. The results from Battery C in this project strongly argue that at least the battery of 35 scores be generally used because of the excellent validity yield from comparatively inexpensive testing time and scoring costs.

## CHAPTER XIII

### A REVIEW OF THE RESULTS ON THE HYPOTHESES

In reviewing the hypotheses, it becomes apparent that those hypotheses which pertain solely to predictors should logically have been formulated prior to the Battery A and B studies. All other hypotheses concerning predictor and situational criteria relations should not have been finally crystallized, however, until the factorial results for Batteries A and B had been obtained and studied in terms of the earlier hypotheses. It was unfortunate that time did not permit completion of the Battery A and B data analyses as well as writing of the Battery A and B reports and more thorough revision and reformulation of hypotheses before the Battery C study was planned and undertaken.

The present re-examination will cover only those hypotheses mentioned earlier, for which some direct or at least indirect empirical evidence was obtained. It will touch upon none of the other numerous hypotheses formulated in the early stages of the project nor upon new hypotheses generated in the course of the project.

#### A. Hypotheses pertaining to training measures:

1. Associational Fluency hypothesis. "High associational fluency scores will be related to successful performance in activities such as instructing, conducting conferences, conducting interviews, advising on technical problems, writing reports, presenting oral briefings, etc." The Associational Fluency factor did appear strongly in Battery C and strongly, although somewhat ambiguously, in Battery A, but failed to appear in Battery B. When the Word Association total score was taken as the best landmark for Associational Fluency in Battery C, Associational Fluency was found to be significantly related to oral reading, lecture notes, lecture ideas, lecture ability, arranging given topics in a best outline, writing from the outline, listening through noise in a control tower, interview listening, reading comprehension, writing and editing tasks, writing organization, and speaking organization. It was somewhat unexpectedly found to correlate positively with the addition and distortion score in the rewriting of a higher directive. Since this predictor correlated significantly with the majority of the criteria, the hypothesis is rather strongly supported. It should be noted, however, that the criterion score on functioning in a conference was not predicted significantly.

2. Empathy Hypothesis. "Persons having more empathy, i.e., intuitive perception of the physical and psychological states of an audience, will be more efficient communicators, especially in public speaking and other talking activities." An Empathy factor was found in Battery B which incidentally was related to scores in the vocabulary test. A related Social Awareness factor was found in Battery C, but with criterion scores appearing on it. Kerr's Empathy test, moreover, was related to estimates of the characteristics of a superior speaker, a reversal of the usual direction from speaker to audience in which empathy is conceived as functioning. In Battery C, however, it was discouraging to find that the Empathy test score had no significant validity coefficients. The Qualities-of-a-Superior-Speaker score had only four significant validities: namely, with the criterion scores from Oral Reading, from On-the-Job Training, from Writing I, and from the arranging of topic cards into a best outline sequence. Although there were some positive findings in Battery B, Battery C yielded negative findings on the Empathy hypothesis, at least in so far as empathy is currently measured. The crucial challenge ahead is to try to construct better measures of empathy, after which the hypothesis should be tested again. There may be several types of empathy that should be measured, so that this and other hypotheses could be investigated in relation to each measure.

3. Expressional Fluency Hypothesis. "The facility with which one expresses an idea in alternate ways will in some degree determine his success as an instructor and in other oral communications." Expressional Fluency appeared as a factor in Battery A, and some of its best measures were used as predictors in Battery C. Its best measure had only two significant validities: with Editing and with the Control Tower Listening scores. The positive results with the Editing criterion were expected, but the relation of Expressional Fluency to the test of listening through noise needs some explanation. Apparently in attempting to form a correct closure where all meaningful sounds are not clearly heard, one needs to have versatility in forming a variety of expressions, in order to find the one that most nearly matches the sounds heard and that also forms a meaningful and reasonable message in terms of the situational context. A second predictor with Expressional Fluency factorial content also was valid for these two criteria as well as for two complex writing tasks and the Designated Leadership situation. In general, the Expressional Fluency predictors were not significantly related to criterion scores involving oral communications, so the hypothesis with its broad prediction about instruction and oral communications (as distinct from written communications) was not particularly supported by the findings. As a caution, it should be noted that no criterion situation was used which specifically required a person in an instructional setting to express an idea in alternative ways.



4. Fear Hypothesis. "Fears usually reduce the quality and alter the quantity of communications. Hence, scores on anxiety or fear scales will be inversely related to one's effectiveness in expression and reception." The measure of fear in the project was the manifest anxiety score of the PE Scale used in Batteries B and C. This anxiety score had the highest factor loading on the Negative Self-Report on Communication Traits and appeared on no other Battery B factors. Unfortunately, this measure of anxiety is obtained by a self-report and was found to be negatively related to the lie self-report score from the same scale. Each of these scores had only one significant validity coefficient out of a possible 27 in Battery C, both pertaining to scores in the Lecture situation. These two validities can be verbalized in the following way: though the relationships were not very strong. The higher the manifest anxiety score, the fewer errors there were in the lecture, and the higher the lie score, the higher the speaking ability rating. With these two exceptions, fear, or manifest anxiety as measured herein, was not found to relate widely to either quality or quantity scores in expression and reception activities.

5. Flexibility Hypothesis. "Flexibility in communication, the ability to adjust words, sentences, and whole communications for maximum reception, will be found more in good communicators than in poor ones." In a broad sense, the fluency factors as well as the originality factors, Spontaneous Flexibility, Broadly Diffused Attention, and Resistance to Idea Reduction, all involve some type of flexibility or lack of it. The combination of predictors that measured these factors overlapped at least three-fourths of the Battery C criterion scores. Thus the flexibility hypothesis was quite strongly supported by the Battery C results and a flexibility factor was found in both Batteries A and C. At least to some judges, however, there may be times when flexibility does not appear to be an asset, because the Conference situational score had a negative, though low loading on the Flexibility factor, as was also true of the Emergent Leadership score for short-range, immediately emerging leaders. This finding suggests that more flexible persons and thus more creative persons may be seen by the majority as performing in ways that are less efficient and effective, especially in brief situations and as seen from a short range (but not necessarily from a long range) perspective.

6. Fluency Hypothesis. "Fluency in communication, the ability to talk, write, and read without hesitation, and to listen without lapses of attention, is an attribute of the good communicator." Landmark scores of the four written fluency factors were included in the Battery C predictors and all four factors emerged separately. All of these landmark tests correlated positively with some of the



criterion scores and in combination they correlated with the majority of the criterion scores. As far as written fluency is concerned, the hypothesis is strongly supported. The surprising finding is that Word Fluency was more often related to criterion scores in communication situations than were Ideational Fluency and Expressional Fluency. Associational Fluency was most related, being valid for predicting the majority of the criterion scores. Fluency in oral expression, reading fluency, and listening fluency were not measured very directly in this project, so little evidence pertaining to their significance in relation to the hypothesis is available, except that the total score on Oral Reading had more correlates and was the most predictable criterion in the study.

7. Ideational Fluency Hypothesis. "Persons having very high scores (or very low scores) on ideational fluency tests will be less effective in transmitting information in an instructional situation than those in the middle range when verbal ability, as measured by a vocabulary or verbal analogies test of appropriate difficulty, is held constant." This hypothesis that optimum Ideational Fluency scores for predicting skills in communication situations are in the middle of the range rather than at either extreme was not tested directly. Since the usual scores of Ideational Fluency tests correlated significantly only with an average of about five criteria but mostly all in the positive direction, it is plausible that an optimum-range type of scoring might occasionally be more valid. The scores in instructional situations were not predicted successfully by the traditional Ideational Fluency scores.

8. Originality Hypothesis. "Use of original words, ideas, or expressive forms in writing and talking tends to arouse audience interest at least momentarily." Since this hypothesis pertains to the arousal of audience interest through the use of original words, ideas, and expressive forms, the criterion that measures audience interest best (though certainly far from perfectly) was the rating on interest of the rewritten higher directive. However, this criterion was not more than barely predicted by anything. So the evidence at hand indicates no strong relationships between this criterion and scores involving originality. Thus, the hypothesis is not supported by this somewhat indirect evidence. Other criteria including some measures of interest in their composite scores were occasionally predicted by tests measuring the use of original words, ideas, and expressions.

9. Silent Reading Hypothesis. "Ability to read silently (to oneself) may differ significantly from ability to read aloud to others." The main evidence related to this hypothesis is that Oral Reading and (silent) Reading Comprehension scores correlated .31 with each other, and yet each of them correlated over .60 with at

least one other score. This evidence indicates that although these two scores overlap somewhat, they differ to a greater degree than they overlap, a finding which supports this hypothesis.

10. Vocabulary Type Hypothesis. "Scores on a reading vocabulary test will correlate more highly with the ability to communicate effectively in writing than in speaking; likewise, scores on a speaking vocabulary test will correlate more highly with the ability to communicate effectively in talking than in writing." Only the reading type of vocabulary was tested, and it was complex factorially in both Batteries A and B and was the second best of the 57 predictors in Battery C. This reading vocabulary score correlated with 8 out of 10 writing criterion scores and with 8 out of 13 speaking criterion scores, so there is some support for the first part of the hypothesis. The second part of the hypothesis was not tested, since no speaking vocabulary score was obtained.

11. Vocabulary Size Hypothesis. "Since persons with extensive vocabularies have more terms to express the shades of their meaning, they will express their communications more exactly, both orally and in writing, than persons with limited vocabularies." Assuming that the vocabulary tests which were used measure size of vocabulary, this hypothesis is strongly supported, since the Vocabulary test was the second best predictor in Battery C, correlating significantly with one or more criterion scores of writing, speaking, reading, and listening activities.

12. Word Fluency Hypothesis. "Word fluency scores are less predictive of communication skills in military situations than other fluency scores or quality of expression scores." This hypothesis was contradicted by the results, since Word Fluency predicted more criteria than did Ideational Fluency or Expressional Fluency, and also since the Word Fluency score predicted more criteria than did about two-thirds of the quality-of-expression scores in Battery C.

B. Hypotheses involving new intellectual measures:

1. Abstracting Hypothesis. "Persons able to abstract essential ideas from lengthy exposition will tend to surpass those who are less able abstracters in their ability to read, listen, talk, and write." This hypothesis proved to be stated too broadly, since no clear-cut single factor emerged repeatedly (including all these scores of this apparent type) which could be called "the ability to abstract essential ideas from lengthy exposition." A high relationship was not generally found across the abstracting or extracting types of scores on the Abstracting, Revision, Outlining, Skimming, Telegram Writing, and Auditory Retention tests. In Batteries A and B the only factor found in this area, besides the Listening

Comprehension factor, was the Battery A factor, the Resistance to Idea Reduction, and possibly the Wordiness of Expression factor in Battery B. Unfortunately, none of the best measures of the Resistance-to-Idea Reduction factor was retained as a Battery C predictor. However, in Battery C a Wordiness of Expression factor appeared again and another complex factor including 5 criterion scores did emerge and was called "Idea Extraction and Thinking Abilities." All of the idea extraction predictor scores did not appear on it, though, not by any means.

The ideas-retained score in Revision II correlated significantly with 13 criterion scores including speaking, listening, writing, and reading comprehension scores. The Outlining and Skimming scores were related to 12 and 14 criterion scores, respectively, which involved speaking, writing, and reading scores (plus in one case a listening criterion score). All Telegram Writing scores proved to be poor predictors of the Battery C criteria. The Auditory Retention score was related to only four criterion scores, but these were a reading comprehension score, a lecturing ideas score, a listening score, and a score on organizing given topics into a total outline. The Abstracting test was not retained in Battery C.

In summary, the hypothesis that various scores on abstracting essential ideas are related to speaking, reading, writing, and listening criterion scores had some support since several, though certainly not all criterion scores of these types, were predicted. It is clear that both the predictor and the criterion parts of this hypothesis need to be limited more specifically in each of several different ways in order to fit the available data which yielded complicated results.

2. Correcting-a-Passage Hypothesis. "The ability to recognize and remedy an incorrectly written passage is one mark of an effective writer and reader." In Battery C the best general predictor of all 27 criteria was the ratio score on Revision II, which was valid for two-thirds of the criteria. The Revision II ideas score was valid for about half of the criteria, so that these two Revision scores predicted many oral and written expression scores, the reading comprehension score, and one listening score. The Editing criterion score ranked ninth out of 27 criteria in terms of number of significant validity coefficients, about one third of the predictors being valid for the Editing criterion. The Editing criterion score ranked fourth in terms of the number of significant correlations with other criteria. A Revision Ability factor was also found in Battery C. Therefore, this hypothesis is strongly supported and should be broadened to include many speaking and some listening activities as well as writing and reading activities.

3. Critical-Mindedness Hypothesis. "The communication effectiveness of those with an optimum degree of critical-mindedness, the self-monitoring of ideas and expressions, will tend to excel that of persons with either a low or an extremely high degree of critical-mindedness." No factor appeared in Battery A or B that was interpreted directly as a tendency to be critical-minded. However, individual differences in critical-mindedness may be involved in several of the fluency factors as well as in some other communication factors. This might be a potential second-order factor since it may cut across several first-order factors. Many of the criterion scores presumably would involve critical-mindedness to some degree. Since no single score has yet been identified as a relatively good measure of critical-mindedness, no sufficiently direct investigation was made on the hypothesis that the optimum degree of critical-mindedness in communications is usually somewhere in the middle rather than toward either extreme of a critical-mindedness scale.

4. Interest-to-the-Audience Hypothesis. "Communicators who can arouse interest in the receiver will evoke a higher degree of understanding than those who cannot." In Battery B one factor which appeared was interpreted as the ability to write interestingly. One criterion score in Battery C was a rating of the rewritten higher directive in terms of its interest to the reader. There were only two valid predictors of this criterion: namely, First and Last Letters and the "indirect" score of the Social Institutions test, neither one having a validity of over .30. The other criteria correlating with this interest rating were the lecture speaking ability, the interview listening score, and the writing organization composite score. No audience was given an examination to see if it learned more from the more interesting presentations, so the hypothesis was not fully tested. However, in the ratings on interest there was evidence of sizeable individual differences in ability to communicate messages in an interesting fashion, whether orally or in writing. Other scores pertaining to interest that appeared only in the two predictor studies were not used directly in testing this hypothesis.

5. Listening Hypothesis. "More efficient listeners will tend to be above average in reading, writing, and talking activities." There were two listening tests with one score each in Batteries A and B. In general, these scores appeared on only two factors in these two studies: namely, Listening Comprehension and Verbal Knowledge. On these factors they were primarily related to reading (vocabulary) scores and also to a few writing scores and to one indirect score on speaking ability. In Battery B there were also some indirect scores on listening from self and peer reports. These various listening ratings appeared (or would have appeared if retained in the factor study) on some but not on all of the rating



factors. No listening factor, as such, appeared in Battery C, although two of the listening criterion scores appeared negatively in the factor called "Excessive Focus on Oral Presentations." In Battery C each of the two listening predictor scores correlated significantly with a different one of the three listening criterion scores. In addition, each one of them correlated with a different score on the Classroom Lecture; one correlated with Emergency Telephone Action; one with Reading Comprehension; and both with the Planning an Informative Paper score which involved reading and organizing a series of cards into an outline. The self-report listening scores were unrelated in most cases to the listening criteria. The three listening criterion scores had low intercorrelations among themselves. It is evident that there was no strong clustering, but instead there was considerable independence among the five main listening performance scores and the listening self reports. The listening predictor tests were each valid for only four criteria, and in every case the listening self-report scores were poorer predictors of this particular set of 27 criteria than were the corresponding speaking, writing, and reading self-report scores. There were a few correlational linkages from listening across to reading especially, and also to speaking, but rarely to writing scores. In summary, the listening domain seems complex and usually shows considerable specificity in relation to other communication scores. More of the evidence in this project nullifies rather than supports the hypothesis. Considerable work is needed within the listening area and between it and other areas before any reasonable minimum level of understanding of the area can be attained.

6. Missing Parts Hypothesis. "Persons who have great facility in supplying the part missing from a communicative structure have perceptiveness of the degree of completeness and balances of a communication and will be better communicators than those with lesser amounts of this ability. (They may also be above average in intuitive ability.)" The tests which most nearly required the filling in of missing parts were the listening tests. Each of these two listening predictors had only four significant validity coefficients. The Control Tower Listening criterion was predicted by fourteen test scores, the Interview Listening criterion by sixteen, and the Identification of Sounds criterion by only three test scores. These three criteria, on the average, overlapped only three or four other criteria. Again there was some evidence in support of the hypothesis, but all results were certainly not positive. Little direct evidence on intuitive ability was obtained in this project, so the parenthetical hypothesis remains in about the same state as before these studies were done.

7. Organizing Hypothesis. "Tests of the ability to organize elaborate verbal material will predict skill in military situations



requiring the summarization of regulations and procedures and the drafting of simple practical plans which are in accordance with those procedures." The best organizing tasks were in the Battery C situational criteria. The arranging of topical cards into a best arranged outline and the Writing Organization and Speaking Organization scores were the best indicators of organizing ability. Each of them was predicted by at least 24 test scores. The Outlining test, which calls for extracting instead of forming an organized message, correlated validly with all these criteria. The conference situation scores were significantly related to both the Writing and Speaking Organization scores. Most of the other scores from situations requiring the drafting of practical plans within given procedures were significantly related to these organizing scores, so the hypothesis was quite strongly supported. Although an organizing factor was not found in Batteries A and B, one did appear in Battery C. Compared to other factors it tended to have a preponderance of criterion scores in it. Eight criterion scores, each from different situations, were present positively on this factor, which was good supportive evidence for this hypothesis.

8. Quality of Expression Hypothesis. "Scores of quality of expression will predict effectiveness of communication better than scores of quantity of expression, such as fluency scores." Just as there are several different fluency factors measuring quantity of expression, so are there multiple factors measuring quality of expression. The Battery A and B factor which stress either quality or lack of quality of expression are Originality, Resistance to Idea Reduction, Wordiness of Expression, the self-report and peer report factors, and the ability to write interestingly (vs. superficially). Numerous factors in Battery C were also quality of expression factors, including one with almost that exact title. As seen earlier, Associational Fluency and Word Fluency scores were good predictors whereas Ideational Fluency and Expressional Fluency were poor predictors in Battery C. The quality score in Plot Titles predicted 10 Battery C criteria, the Telegram Writing scores were poor predictors, the Revision II ratio score was the best single predictor in the battery, the quality scores on Similes I and in Word Association were fairly good predictors, the indirect and far reaching responses on Social Institutions was a good predictor, and several of the most relevant self-report scores were good predictors. In summary, both quantity and quality scores of certain types were good predictors whereas other quantity and quality scores were poor predictors. In general, quality scores were probably as good if not slightly better predictors than were quantity scores, even though explicit quality scoring is in a fairly primitive stage of development. However, some of the error and distortion criterion scores which measure "negative quality" hardly

correlated with anything, perhaps because these types of scores were rare among the predictors and almost absent, too, among the criteria.

9. Reading Aloud Hypothesis. "Ability to read aloud depends on articulation, enunciation, pronunciation, and voice quality, all of which are intrinsic in verbal communication. It is therefore hypothesized that persons with high ability to read aloud will be better all-round communicators than persons deficient in this ability." The Oral Reading criterion score was the only direct measure relevant to this hypothesis. It was surprising to find that this was the most predictable of the 27 criterion scores. It also correlated significantly with half of the other criterion scores and only four criterion scores had a greater number of criterion correlates. The Rate of Oral Reading score tied for third among the 60 predictors, being valid for 16 of the 27 criterion scores. Therefore, the hypothesis had very strong support from this study.

10. Reduction Hypothesis. "Persons able to make wordy expressions into concise statements tend to surpass in both writing and talking than those less able to do so." A Wordiness of Expression factor was found in Batteries B and C. This hypothesis differs somewhat from the Abstracting hypothesis since it emphasizes reduction in wordiness rather than extraction of essential ideas. Among the Battery C predictors the best measure of this reduction hypothesis was the Revision II ratio score of words per idea, which was the best predictor in the battery, correlating with two-thirds of the criteria in the negative direction, as expected. The Editing criterion score was quite predictable and also correlated significantly with the majority of the criterion scores, having more criterion correlates than all but three other criterion scores. The results in this project strongly supported the reduction hypothesis.

11. Skimming Hypothesis. "Those efficient in typical reading comprehension tasks are more likely to be good skimmers than are poor readers." The Skimming exercise was used with two separate scores in Batteries A and B and with a composite of these two scores in Battery C. Skimming appeared on the Verbal Knowledge factor on both Batteries A and B, on the Broadly Diffused Attention factor in Battery A, and on Associational Fluency (negatively), Wordiness of Expression (negatively), Organizing Ability, Concentration and Efficiency in Dealing with Messages, Quality of Verbal Expression, Command Supervisory Ability (negatively), and on the Social Awareness factor in Battery C. In Battery C the Skimming composite score correlated significantly with the criterion scores from Oral Reading, Emergency Telephone, Reading Comprehension, Planning an Informative Paper, and the task of arranging topical cards into a

best outline. However, it failed to predict two other reading criterion scores along with criterion scores in writing and in other communication tasks. Consequently, this hypothesis was generally but not fully supported by the data in this project.

12. Subtleness Hypothesis. "The superior communicator will tend to surpass the poor one in ability to produce and to receive subtle communications." Degree of subtleness in communicating or the ability to discern subtleness were not deliberately tested in this project, but they may be represented to some degree in vocabulary and reading comprehension scores, each of which had many correlates; in listening scores, each of which had several correlates; with the leadership and conference scores, which had a few correlates; and with empathy, which had very few correlates, none of which was a situational criterion score. This hypothesis was only indirectly tested and received moderate support from the data herein.

13. TWX Hypothesis. "The ability required in telegram writing to abstract and compress the essentials of a communication into a few carefully chosen key words in abbreviated sentence form will be found significantly more in good communicators than in poor ones." One somewhat unexpected finding was that the scores on the Two Telegram Writing tests, on the two Revision tasks, and on other reduction tasks did not cluster very closely together as a group. Apparently there is a fairly high degree of specificity in these types of tasks wherein the presumably minor differences between Telegram I and II tasks proved to be fairly important differences and reduced their intercorrelations more than was expected. In Battery C the three scores on Telegram Writing II were three of the poorest predictors in the battery. This gives relatively good support to the idea of specificity, since none of the criterion scores involved the Telegram Writing type of activity, and Editing was one of the few criterion scores predicted. This result for the telegram scores is in striking contrast with the finding that the two scores yielded by the Revision II task, scores with the same type of scoring system as used in the telegram task, were among the best predictors in the battery.

C. Hypotheses involving new personality measures:

1. Aspiration Hypothesis. "Persons aspiring to a high level of communication are more likely to be effective writers and speakers than those aspiring to only a low level." An aspiration factor involving ratings across every main channel of human communication appeared strongly in Battery B, and all predictors measuring this factor were retained in Battery C. The four difference scores between minimum satisfactory and presently self-rated ability were poor predictors of the criterion scores, a fact which gives little



support to the hypothesis, since these difference scores were estimates of how far above their present abilities they aspired to attain as a minimum. They all emerged together on a Battery C factor which contained no criterion scores. On the other hand, the four minimum satisfactory ability scores were among the best predictors in the battery, especially across speaking and writing criteria, thus supporting the hypothesis. All four of these scores loaded highest on the Minimum Aspiration Level factor in Battery C which also had seven situational criterion scores appear on it. In each case the writing aspiration score was at least as good a predictor as the reading, speaking, and listening aspiration scores, and sometimes it was better.

2. Experience Hypothesis. "Persons having a rich background of experiences in communication tend to be more effective in communication than those with a limited background." The four Biographical Information Blank scores were designed to measure relevant communication experience. Perhaps other scores, such as vocabulary scores, are at least indirectly related to some kinds of communication experience, especially in reading and writing. In Battery B the biographical scores appeared strongly on the Self-Estimate of Expressional Ability factor, and also appeared with a few significant factor loadings on the Self-Estimate of Writing Ability. In Battery C two biographical factors with criterion scores on them emerged, one for reading and writing, and the other for listening and speaking. All four biographical scores were valid in predicting oral reading and instructing ability. One or more biographical scores also correlated with each of the following criteria: Designated Leadership, Emergency Telephone Action, Administration of Disciplinary Action, Speaking Organization, Reading Comprehension, the three main writing tasks, and the distortion and addition scores on rewriting a directive from higher headquarters. In summary, there was considerable support for this experience hypothesis, although several communication criteria including two listening criteria were not validly predicted by any of the four biographical scores.

3. Extemporaneousness Hypothesis. "The ability to speak extemporaneously is a good single predictor of other talking abilities." Since no predictors involved oral expression except indirectly, the only relevant interrelations were among situational criterion scores. The Conference, On-the-Job Training, Emergent Leadership, Designated Leadership, Emergency Telephone, and Administering Disciplinary Action situations all involved some extemporaneous speaking, though not necessarily before a formal audience. Probably the best score of general speaking ability was the public speaking rating on the Lecture situation. This speaking ability rating tied for first in terms of its number of significant

correlates with other criteria. Four of the above six criteria correlated significantly with this speaking ability rating, as did also the Oral Reading score, clearly a spontaneous reading score. Therefore, there was some, although not complete, support for this hypothesis.

4. Interest in the Communicator Hypothesis. "Persons with a high interest in verbal materials will usually be better communicators than those with a low interest." The interest predictors appeared only in Battery B and had a low but significant loading on the Listening Comprehension factor, a fact which supports the hypothesis, and a higher loading on the Self-Estimate of Expression Ability. In general, this self-report method of evaluating interest showed similar results to other self-reports in Battery B, so that one could infer somewhat parallel results to other self-report scores if the interest scores had appeared in Battery C. This would lead to some further support for the interest hypothesis.

5. Self-Reports Hypothesis. "Self-reports (self-ratings), if honestly filled out, should give some evidence of a person's communicative abilities and should correlate at least moderately with actual performance. And persons will tend to rate themselves more honestly on communicative abilities than on intelligence or on usual personality characteristics." Many of the self-report scores did correlate with several of the criterion scores in Battery C, suggesting that they tend to be given with a good deal of honesty. Since they generally measured different factors than the fluency and other ability factors (as seen in Battery B), they provide a good supplemental measure in a prediction battery. This was true especially for the new self-report scores, all of which were derived from new measuring instruments designed and constructed for this project. Eight of the 20 predictors with the highest number of significant validities were self-report scores. This self-report hypothesis proved to be strongly supported by the Battery C results.

6. Stress Hypothesis. "Communicators who are good under normal conditions should be able to concentrate and continue communicating better when placed under stress than poor communicators." While all tests in this project probably involve some degree of stress, certain situational tests, such as Oral Reading, Classroom Lecture, On-the-Job Training, Designated Leadership, Emergency Telephone, and Administering Disciplinary Action, seemed to be more stressful than the others. Since most of these correlated with several predictor scores and several criterion scores, the hypothesis receives some support from the evidence in this project.

Summary. Since the communication abilities domain proved to be very complex, most of the initial hypotheses on this project



were too general. Any reformulation should obviously consider the abundant new findings in this project and usually should change in the direction of making the hypotheses more specific.

The above results indicate that a similar percentage of positive findings occurred across the three hypotheses categories: namely, hypotheses concerning existing measures, new intellectual measures, and new personality measures. The main differences were that for new personality measures the findings were always positive to some degree, whereas the strongest supportive findings as well as the greatest absence of relationships appeared on hypotheses pertaining to previously existing measures.

These hypotheses were also classified according to the categories of reading, listening, writing, speaking, and self-reports. Negative results were found for some hypotheses in listening, writing, and self-report categories, whereas strong positive findings occurred in a higher proportion than average in the reading, writing, and speaking categories. Stated alternatively, the results for the above writing and self-report hypotheses varied from non-supportive to strongly supportive evidence; the results concerning the speaking and reading hypotheses were either weakly or strongly positive; and the results pertaining to the listening hypotheses were either not supportive or more weakly positive.

## CHAPTER XIV

### CONCLUSIONS AND IMPLICATIONS

As we move further into some of the least explored areas of human behavior, we are often dealing with important characteristics that are vital in many high level activities in our society. Even though all measures that can initially be developed in such areas will not be as precise as we might ideally desire or hope to obtain eventually, the results in this project strongly suggest that many measures will not be seriously lacking in precision and that we shall learn how to improve the measuring devices by working in the area. In other words, initial attempts in such areas can yield positive results which can be quite worthwhile and provocative. Consequently, the question of possible lack of sharpest precision in measuring devices should not provide sufficient excuse for an unwillingness to venture into important areas of human behavior that have been largely unexplored heretofore by scientific methods.

The concept of communication abilities as used in this study is very broad and includes the total range of central processes and receptive and expressive abilities together with the relevant emotional, attitudinal, and personality characteristics that function in one or more human communication situations. In fact, many of the expressional tests were described by clinicians as tests of personality, upon the grounds that they are somewhat projective in nature and permit scores and interpretations of responses such as those typically obtained in projective tests of personality. Certainly force and refinement and integrity of character contribute to the quality of communication. Tact, emotional sensibility, and imagination, as well as judgment, must supplement the specific skills of the efficient communicator.

After reporting and reviewing the large body of factual information derived from these empirical studies, a most striking impression is that communication skills comprise a vast, complex domain involving a large number of significant variables. This was somewhat anticipated at the beginning of the project when we postulated 43 factors. These postulated factors could be classified as 12 landmark factors, 5 factors expected from well-known existing tests that might measure a factor indicated by their name, and 25 new expected factors. In the studies on Batteries A and B, 8 of the 12 postulated landmark factors appeared and 2 of the 5 existing tests measured newly isolated factors which were interpreted to correspond to the factor anticipated in the name of the test; about 7 of the 25 newly postulated factors appeared and 3 other new ones emerged that were not expected--namely, Idea Listing Facility,

Broadly Diffused Attention, and Self-Estimate of Writing Ability. In the large Battery C factor analysis study, 25 factors were found which could be interpreted. These included 5 landmark factors and 5 of the postulated factors which had also appeared earlier in the factorial studies of Batteries A or B. Most of the 15 remaining factors were new, but a few of them, such as the factors on Organization Ability and Revision Ability, had been postulated.

The 43 factors postulated to be functioning in the hypotheses reviewed in the previous chapter were compared with the factors found in Batteries A and B. In these first two studies, 27 significant factors were extracted, 20 of which were given at least a tentative interpretation. As only 4 or 5 of these were found to be identical or at least very similar across Batteries A and B, it is apparent that more than 20 different factors (separate dimensions) were isolated in the two studies. Considerably less than half of these factors in Batteries A and B had been isolated in previous research studies. A further indication that the project ventured rather fully into unexplored areas is the fact that only 5 or 6 of the 25 factors in Battery C had been found in factorial studies previous to this project.

Admittedly a multitude of factors, undoubtedly more than 30, were found across Batteries A, B, and C, most of which had never emerged before in factorial studies and did not appear more than once in this entire project. At this initial stage of exploratory work, the reader should not look upon many of these new factors or their titles as being very sacred in any sense. Instead he should understand that these new factors mainly illustrate effectively, at this early state of research knowledge, the great complexity of the areas of communication abilities and the type of titles that might eventually be found when comparatively stable landmark factors are established in these new communication areas which have been explored for the first time in this project.

The isolation of a Verbal Superficiality factor is provocative, especially since it correlated negatively with the rating on the interest, clarity, and originality of the Word Story written by the examinees. There is some evidence that this factor is moderately or perhaps even highly related to the earlier Sensitiveness to Problems factor. This evidence suggests that although persons scoring high on Sensitiveness to Problems can readily name many problems that exist, they may tend to sense the superficial, and not necessarily the deep and fundamental problems or changes that are needed. It is challenging to find that the best measure of Verbal Superficiality in Battery C failed to predict any of the 27 situational criterion scores. At least to date, superficiality appears to be no asset in communication situations. Although it is neither

an asset nor a liability to be able to write the obvious, it definitely is an asset to be able to notice and write far-reaching insightful changes that could be made, since scores in this latter ability predicted half of the situational criteria.

The current state of knowledge indicates that the multidimensional communication domain can neither be easily nor adequately represented by a simple model or theme entailing only four or five characteristics. Nonetheless, it is felt that many steps forward were taken and tremendous progress was accomplished in this exploratory project. Numerous insights were obtained which move some frontiers forward and also illuminate and clarify the previous state of scientific knowledge of this field. This project accomplished the groundwork for general and differential prediction of communication skills as outlined in the Battery C study. Several other practical applications can also be readily implemented as outgrowths of the results in these three large studies.

The complexity of this domain is not surprising if one recognizes that the total communication abilities concept being studied and measured might alternately be entitled social intelligence. This so-called social intelligence draws not only upon some of the previously measured intelligence factors but also includes new intellectual and nonintellectual factors that function in information receiving, information processing, and information transmitting situations. The general attempt here was to describe as much of the phenomena in social situations as possible in terms of individual communication skills, with the strong hunch that a profile of communication ability scores of each subject, instead of social-group scores or interaction scores, will account for the large portion of the phenomena that occur in social situations.

The fairly obvious categorizations of most communication activities into reading, listening, writing, and speaking has some advantages, but overwhelming evidence is now available that those categories are not empirically separate and distinct areas. In fact, many linkages were found across two or more of these four categories, while there were also absences of linkages among measures within each category. This was true for both criterion and predictor scores.

If we consider all combinations of reading, listening, writing, and speaking that are theoretically possible, we find one combination of all four types, four different combinations of three types, six combinations of pairs, and the four types taken one at a time. In examining the empirical relationships among the 27 criterion scores, the most frequent combinations were reading-writing-speaking, and writing-speaking, which were followed closely in



frequency by the combination of all four channels. These three combinations accounted for two thirds of the linkages among the criteria. Only three criteria had no cross-linkages to other channels. This evidence argues strongly that these four main channels do not provide a very fundamental scientific basis for distinguishing between communication activities. Instead, some intricate interweaving exists among these channels. It is a challenge to attempt to account for the cross linkages. These relations may be partly due to such things as some commonality in the message or thought to be received or to be expressed, in the organizing of materials regardless of channel, and in the higher level associative brain areas functioning in conjunction with the more channel-determined portions of the brain. There is also an intriguing question about the lack of generality within each channel.

A functional classification of the situational tasks also yields interesting results. All but two or three of the tasks were of at least twofold complexity, in the sense of involving one reception and one expression channel for examinees during the administration and performance on the test. Only one of the tasks were of more than twofold complexity and it included reading, listening, and speaking activities. At least two criteria only involved reading activities except for the recording of a final check mark on answer sheet or the arranging of cards into a series. There was an approximate balance across the reception-expression channels, since about half of the tasks involved listening reception and the other half reading reception; similarly about half were written expression and the other half oral expression tasks. There were six reading-writing, two reading-speaking, three listening-writing, and five listening-speaking tasks in the criterion situations. This functional classification supplements the correlational classification of the situations and substantiates the correlational findings at least to the extent of indicating that all but a small number of the situations involved a combination of at least two channels. However, the correlational classification showed the majority of the situations to have linkages among at least three of the four main channels of communication.

The above results strongly indicate the communication tasks do not readily fall into one of the four communication channels but usually involve a combination of two or three of these channels. This fact suggests that the four channel classification system of reading, listening, writing, and speaking is not a fundamentally sound system psychologically and correlationally, since a very small percentage of communication activities falls clearly into one of the main categories. In seeking a better classification system, one may at least temporarily turn to combinations of these categories. As the combinations become more complex, the argument



becomes stronger that the particular communication process is more central than peripheral in nature. Consequently, many typical communication activities are essentially central, associative, thought processes instead of being primarily determined by the particular input or output channel. Even those that are mainly channel determined tend most frequently to involve at least two channels and are complex and to some degree coordinative and associative in nature.

A classification system of four channels plus all possible combinations of these channels could be further expanded to include indirect indicators of communication skills such as subjective reports of relevant personality characteristics. In the Battery B study these indirect indicators tended to be relatively independent of most of the abilities measured more directly in the communication predictor tests. However, in the Battery C study, these indirect indicators did clearly overlap many of the communication skill scores in the complex situational tasks. Therefore, this category of personality characteristics is not as independent from the channel combination categories as might be ideally desired for classification purpose.

This finding again supports the theme that the total communication field is very complex. Nonetheless, one hope for simplicity in doing practical work in this field is to utilize as fully as possible the linkages that do exist within and across these categories. In other words, when a human communication problem arises, one could refer to the relevant data within the abundant factual information collected in this study to determine the existing linkages and how they can be put to use to yield an improved, practical solution to the problem.

The finding of great complexity in the communication area contrasts with the findings in the initial approach in the area of intelligence. A single measure, even though composite in nature, was first used to represent intelligence, and it took considerable time and some effort to overcome the resistance of moving from a simpler to a more complex representation before multidimensional representatives of intelligence gained much acceptance. Perhaps in the communication area, it would be more appropriate and even more correct in the beginning as well as more efficient in the long run, to start at the specific rather than at the general end of the range of possible concepts. In other words, the picture might be more accurate and progress might be more rapid if we were to assume, initially in a communication area, that specificity rather than generality (i.e., that complexity rather than simplicity) usually holds. Then the search would be made for the linkages and

clusters that do exist in the total area. It may be necessary and wise in testing and in training to proceed with quite specific batteries and specific training programs pertaining to human communications until sound generalizations do emerge. One might begin with the idea that everything is essentially different rather than essentially the same and with the expectation of moving gradually toward more correct understanding. And people might tend to join the effort of moving toward simplification, in contrast with their tendency to resist moving toward a more complex model of the phenomena under consideration. Because of the intensive studies on predictors and the relatively large sample of situations that were investigated in this project it is already possible to move a considerable distance toward such a clarification. In summary, it would seem wise to start with a hypothesis that many measures-- and not just one--are needed in order to span to even a minimal degree the vastly complex domain of communication.

In this project even though the predictors were complex, they tended to be more specific, simple, and pure measures than were the communication situational criterion scores. Consequently, it would usually require more predictors than situational criterion scores to span a given communication subarea.

It was rewarding to learn that multiple scores can frequently be extracted from performances on communication tasks and that sufficiently often the multiple scores derived from a single task will be quite unrelated to each other. In many cases, two scores per task both showed validity and yet were not too highly related to each other for separate practical use. For example, many attempts to obtain quality scores in addition to quantity scores proved to be successful in more ways than one. These quality scores were often good predictors and in some instances were not as difficult to obtain as is traditionally thought by those reluctant to attempt to develop and use them. With more experience in developing and using quality scores, other practical shortcuts in scoring procedures might be forthcoming. The combination of both quantity and quality scoring of performance proved to be useful and sound in many cases; however, the lesson was learned that if the nature of the task sets high minimum standards for each expression or performance, then chances are very great that so-called quantity scores will be essentially quality scores, so that only one type of score can really be obtained.

In comparing the main communication areas in terms of generality versus specificity, it was found that the reading area showed generality within its area as well as being linked across the other areas. Listening tasks seemed to be relatively separate from each other, being only loosely clustered at best; nonetheless, a few

linkages occurred from listening into each of the other three main communication areas. The writing and speaking areas are definitely multivariable in nature, with some resulting specificity within each area, but with some interesting cross-linkages both between them and from them into every other area. These linkages across main channels, for example, permit speaking scores to be predicted by self reports and by correlates of a nonspeaking nature which can be measured in very practical ways. Another noteworthy linkage is the spread of the vocabulary variance especially into the listening domain. This finding suggests that the size of one's vocabulary can partly determine one's effectiveness as a listener, not only in understanding but also in sustaining his listening efficiency in a session. A surprising set of linkages appeared with the criterion score on spontaneous oral reading which was so complex that it was predicted by a large number of paper-and-pencil test scores and ratings that did not directly measure speaking performance. The implication is that spontaneous speaking as well as speaking after preparation are both probably even much more complex than oral reading, even though they have yet to be overlapped by as many predictors.

Merely from the number of past studies that have been done on reading abilities, good results would be expected in predicting reading criteria if a large battery of reading tests were used as predictors. However, it was quite surprising to find the two reading criteria to be so predictable by the Battery C tests which strongly emphasized writing scores. Reading scores were also indirect predictors of speaking. These results suggest that reading skills, and knowledge acquired through reading, are fundamental grounds underlying good expression as well as good reception in communications.

The results in the listening areas were somewhat puzzling, for the area seems to be much more complex than a superficial view would indicate. This complexity argues for a profile of listening abilities, each part of which is largely different psychologically and neurologically from the other parts of the profile. This complexity argues strongly against listening as being almost entirely dependent upon and accounted for by sheer physical hearing ability. The listening scores did not cluster strongly with each other, and yet at times they showed interesting linkages to other channels of reception and expression. Such linkages may indicate a feeling for flow of language or a sense of order or other important attributes. For example, Oral Reading and the arranging of cards into a best outline each correlated with two of the listening criteria, while three writing criteria each correlated with one of the listening criteria. Several thorough studies in listening are needed if that area is to be outlined and understood as exactly and fully as the writing area.

It is reassuring to find that vocabulary scores are good general predictors. This gives sound empirical bases for encouraging all people on the job as well as in educational and training programs to develop a good working vocabulary, functioning well through input and output channels as well as centrally. The subdivision of vocabulary variance into multiple factors also makes sense upon close study and is consistent with the finding that the communication domain is complex.

A lesson learned in this project which has also been found previously in the writers' experiences is that self-reports obtained on well-designed instruments can yield direct answers that can be accepted with some confidence. This was true for negative as well as positive self-reports and was more true of direct than of indirect responses about oneself that were presumed to be relevant. These findings may partly be due to the less threatening nature of communication testing in comparison with intelligence and personality testing. In other words, it is nearly always more acceptable in our society to admit that one cannot write or speak well or does not like to do certain communication tasks than it is to admit shortcomings in intellectual abilities or in personality characteristics.

The results on negative self-reports were provocative. Apparently there are wide differences in the ability or tendency to report on one's shortcomings, and such scores are quite different from the self reports on one's assets. The direct phrase check list approach yielded a more valid negative self report than did the more subtle Minnesota Multiphasic type of personality questions pertaining to degree of anxiety. Although most validities were negative for negative self reports, there were a few evidences in the first two factor studies that the willingness to report one's shortcomings was a favorable, healthy characteristic. The newly constructed self-report scores specially designed for this communication project were valid against many more criteria on the average than were some existing self report, personality test scores with "glamorous" titles, such as manifest anxiety, empathy, achievement motivation, need for affiliation, and need for status.

The four Satisfactory Ability Ratings, which were minimum-level aspiration scores, each predicted about half of the criteria, whereas difference scores, which indicated the minimum distance of improvement to which one aspired above his current level, failed to predict almost all of the criteria. This is an example from these self reports, that a direct approach calling for a direct answer on a relevant aspect often tends to be more valid than an indirect (psychologically intriguing) approach involving a fancy scoring system.



Even though the direct self reports were quite highly related across the broad field of reading, listening, writing, and speaking, nonetheless, there were some separateness and differences in these ratings that usually made sense in terms of their difference in degrees of validity and inter-correlations with other communication measures. For example, the all-round self report on writing ability was a valid predictor of 16 situational criteria, whereas the all-round self report on listening ability predicted only 3 criteria. It is comforting to know that in this complex, communication domain one can use short, practical, direct-approach self reports with considerable effectiveness.

All self-report scores did not cluster together in a single factor but were spread across several factors. Most self-report scores proved to be factorially complex. They also generally measured different factors from those measured by the paper and pencil types of communication tests. The self-report scores were valuable supplements to the communication abilities scores, since both types proved to contain many valid predictors of Battery C criteria and yet the two types did not overlap each other very much.

The ratings by peers related to some degree to various self report scores, but were sufficiently different to fall on a separate factor by themselves. Therefore, it seems wise to use a combination of evaluations in communications, first having the examinee take ability tests of both paper-and-pencil and situational types, second having the examinee give a rating of his own abilities, and third having peers own reports on his abilities and relevant traits. The best single approach seems to us to be the situational type of ability testing, with the reminder that many situational tasks are required to obtain wide coverage of communication abilities.

It can be rather inspiring to hear persons give lectures on the importance of empathy in teaching, in selling, in interviewing, in counseling, in conversing, etc., but it can be really discouraging to find that we as yet have no particularly good self-report or other measurement of this presumed characteristic glibly designated as empathy. Several leads have been suggested for building new measuring devices that might be better measures of empathy.

The inherent interest of the whole range of communication activities and the relative insignificance of manifest anxiety in the subjects should not be overlooked or minimized. Some persons have asked why the tests are not used as parlor games. Other comments by Battery C subjects indicated that they returned on the successive Saturdays in order to find what the test was like



behind each of the doors leading into testing rooms that they had not yet entered. In other words, their curiosity was stimulated instead of dampened by the varied and interesting nature of the tests that they had already taken.

When the Battery C subjects were given a profile report on their communication scores, they were extremely though pleasantly surprised at the vast number of scores obtained on them, and they pondered at length over the relative jaggedness of their profiles across the different tasks. Perhaps this unthreatened attitude and the sustained effort to discover their true self contributed to the successful use of self-reports and peer ratings.

At the present it appears advisable to name very specifically the criterion one wants to predict, or else the prediction may fail because of the complexity and lack of generality in the total communication domain. In other words, in prediction of communication skills a researcher must aim in each of several different directions in order to hit all of the different targets with the maximum accuracy attainable. A similar result will probably be found when specific communication skills are to be trained and when various communication training programs are evaluated.

The predictions are better within some areas of communication than within others, at least partly because of differences in the degree to which work has been accomplished within these areas. For example, predictions were often poor in the listening area, in which the many variables that need to be measured are still largely unknown.

The present results throw some light on questions about relations between different channels of communication. Because there are some definite linkages and because the typical correlations found are low positive, it is generally true, to at least a slight degree, that better readers tend to be better writers even though one involves reception and the other involves expression. The same is true for most pairs of communication channels, with the listening channel showing the weakest cross-links.

Answers are now available to the oft-raised question whether good writing and speaking abilities generally occur together in people. In Battery C we examined 228 such relationships between specific writing and speaking scores. The highest single linkage between the expression channels of speaking and writing is fairly strong ( $r=.50$ ), but nearly all of the other few linkages out of a possible 228 between these channels are much, much weaker in degree, with the median correlation between speaking and writing tasks being only .12. Nonetheless, one can say that there is at

least a slight tendency for better writers to be better speakers, and vice versa. However, where low statistical relationships exist, it should be understood that there is a possibility of nearly all profile shapes across a pair of channels. For example, even though there is a low positive relation between overall speaking and writing abilities, this relation includes many exceptions to the trend, so that there are definitely some individuals who are good writers but below average speakers--and vice versa; however, the slight trend found in the whole project is for good communication abilities to appear together slightly across people.

Among those who conducted the present studies there is strong conviction that communication abilities become increasingly more important as one moves to higher and higher levels in an organization. In other words, it is believed that communication abilities are truly high level skills that underlie many important activities, such as human relations and leadership. Not only should high level executives coordinate, communicate, receive communications effectively, and have broad, flexible response sets and perspective, but many other key positions strongly require certain communication skills. Communications are crucial in such activities as instructing, giving training on the job, learning, participating in conferences and decisions, conducting investigations, collecting and processing information, conversing, and giving and receiving oral instructions.

Many techniques used in certain professions, such as interviewing, counseling, and dealing with patients clinically, are fundamentally communicative in nature. In today's shrinking world human communication skills are of utmost importance. Even the scientific method, which is so important in our current way of life and which may also be so vital in determining which nations survive, has many communicative features and in a broad sense can even be seen as a communication process of provoking thought and effort, raising questions, stating hunches, collecting and analyzing information, and reporting results, principles, and mathematical models that abstract and represent the entire information assembled. Certainly, human beings are essential in scientific progress and are deeply involved in all of the communication features in the scientific method.

As ideas continue to emerge during the current scientific age, additional valuable aide to human communicators may become available. For example, continuous paper with equally-spaced perforations will permit the rapid typing of each of a large number of ideas into paragraph form so that the paper can be separated at the perforations between paragraphs and the paragraphs can readily be shuffled into a better sequence. In this way an "idea file" can

be readily transformed, through one or two revisions, into a well-organized written exposition. In fact, one of our situational tests involved the arranging of topical cards, each also containing a brief paragraph, into a best sequence. With the coming of automation it may be possible not only to have machinery to search out relevant information but also to assemble and arrange it in a reasonable sequence and possibly prepare a first rough draft manuscript for the writer. Some other communication activities may also be similarly mechanized, such as a first approximation of translation from one language into another. As further aids become available, persons should learn to use these mechanized tools and should also develop their own skills especially in the portions of the communication task that have not been mechanized.

Human relations is another topic recently emphasized in organizations that is in many ways primarily communicative in nature. Similarly, effective leadership entails proper and timely use of many different communication skills. These topics further illustrate the underlying importance of communications in human activities.

The effort in this project can be alternately described as an attempt to measure the human variables in a large organization's communication system. The strong conviction is, first, that the efficiency of an organization is highly dependent upon the efficiency of its communication system and, second, that the crucial variables that bring about efficiency or inefficiency in its communication system are the human communication variables. More specifically, experience had indicated that when everything goes smoothly in a part of an organization, it is usually possible to identify one or more persons who are skilled communicators and who are very aware of the importance of efficient flow and management of information. Contrarily, whenever things become really "fouled up" and inefficient, chances are great that you can find that one or more persons have failed to communicate or have somehow brought about distortions during the receiving or the sending of essential information.

If the main hunches and hypotheses in this study are correct about the importance of human communication skills to the efficiency of an organization, and if training activities in communication skills could be made to be as interesting and acceptable to the trainees as the testing activities were in this project, then it should be possible with proper emphasis and priority to rapidly strengthen the personnel and consequently the organization by developing appropriate communication training activities. An increase in the student's interest in the training procedure is only one of the foreseeable advantages of a new method.

One main feature of this project was a much more analytical approach to communication skills and abilities than was customary in the teaching and grading in formal English, speech, and communication courses. The fact that the domain proved to be extremely complex more than justified this analytical search for a set of useful noncomposite variables that function in communication activities, since it demonstrated that the problems of the student are somewhat different than we had presupposed. The relative simplicity and therefore, manageability of the communication tasks in the predictor tests together with their wide variety may largely account for their interestingness to the examinees in the present project.

All the evidence in the entire project argues that for widespread coverage in either testing or training in the communication ability areas, one cannot count much on "spread-effects," i.e., on either wide generalization of validity of tests scores or on wide transfer of training from any single communication task. Consequently, one must deliberately use a great multitude of tasks sampling widely and representatively the entire communication area under consideration, in order to obtain a good coverage in either testing or training programs for communication abilities.

Much evidence appears in these studies that there is need for strong recognition of the complex nature of many typical communication activities, especially in training programs. The practical importance of such understanding may be considerable. It is strongly suspected, for example, that people have sometimes been introduced into public speaking not by sophisticated speech teachers but by others who use essentially a "sink or swim" method. It is not surprising that many people become negative about giving speeches and some become serious stage fright cases requiring remedial training by speech experts as a result of rapid immersion into such a multivariable situation.

Analogies may be drawn from current practices in the teaching of swimming. The learners are usually exposed gradually to the complex situations and performance. They become accustomed to standing in water that is not too deep. They then practice breathing while in the water. They hold onto the sides of the pool in shallow water and practice kicking. Some methods require the instructor to stand in front of the learner and give some physical as well as moral support from that position as the learner first attempts to perform the whole swimming function, so that he does not have anxieties aroused by the frightening open body of water before him, etc. In a similar manner, skilled instructors might introduce persons gradually to the public speaking situation, by having one or more of them in turn experience standing before an audience without also being required to speak. They might become



acclimated to audiences through a gradual increase in the size of the audience. Members of the audience might also report to the future speaker how supportive, instead of how critical, they will be when later he will make his first attempts to speak as well as appear before them. A gradual introduction to microphone situations could similarly be accomplished. And the speaking exercises could be experienced in small simple portions and in safe simple situations, as the kicking exercises are practiced in swimming. The important point is that the person would be introduced to only a few of the variables in the situation at a time and would practice the activity in its simpler forms before being introduced into the total complex situation in which he is also required to give a complex performance. Similar approaches might be used, where this has not already been done in writing, listening, and reading activities.

After trainees had gained sufficient mastery of simpler communication task somewhat parallel to the present predictor tests, they could then be trained in more complex communication situations. It would be possible to build one or even several representative sets of situational problems for training purposes, by referring to the nature and frequency of communication activities in the organization and by following the models of the situational tests described in this report. Tasks that are parallel to the present set of situational tests would provide a comprehensive set of interesting training exercises in communications. Scores could be provided promptly to the trainees as feedback guidance and the nature of each task and its scores could be explained to them to increase their insights into communications. There is some reason to doubt that present educational programs in English and speech systematically cover anywhere near as wide a variety of communication activities as these exercises would provide. Apparently the interest in these situational tests was due to their wide variety and also their reality in terms of being typical life situations.

From the responses of airmen on the Batteries A and B tests, it is evident that nearly all of them displayed weaknesses in one or more types of communication tasks and could profit from suitable training in their areas of weakness. Those who do not respond adequately to training could be assigned more into directions related to their areas of strength in communication.

Our first preliminary attempts to modify and use our communication ability tests as training devices have worked most successfully recently in classrooms at the junior high level. They have not only provided a rich variety of experiences which the students enjoy but they were also effective in reaching students who had tended not to participate and were thus being educationally deprived in classrooms as typically conducted. Practically all the

evidence collected on these first attempts to vary away from traditional classroom approaches showed a significant difference in the expected direction.

As was observed in examinees in this study, most trainees would be surprised to find the number of different scores that could be obtained in typical communication situations. This might help motivate them to practice and improve each type of score. They would also likely show some surprise at the unexpected nature of some of the communication tasks that nonetheless might be very important in activities at higher levels in an organization. For example, practice in editing one's own writings and in expressing information accurately, compactly, and also interestingly can increase a person's value to the organization. The prompt feedback of scores of their performance would help them to recognize important aspects that they might overlook because of their inexperience and lack of perspective about the communication complexities in any large organization.

The training of persons in a wide variety of communication activities can improve their attitude and attention to communications as well as their skills in dealing successfully with situations that are primarily communication situations, though often not recognized as such. Once again, the training tasks might initially be relatively simple and specific in nature so that a person could attain some mastery and feeling of success before being trained in the more complex situations, which may largely require a combination of several of the simpler communication skills. In other words, some training on simpler, manageable parts might be accomplished earlier at the lower levels in the organization before confronting the advancing trainee with the truly challenging, and previously too complex, whole situations. These latter situations become less complex for the trainee to manage as he masters parts of the whole and combines several smaller parts into single larger units for ease and efficiency of handling.

Daily training in communications could also be conducted on the job. Supervisors should generally be more aware of the importance of good communications and should instruct those under them on communication techniques as daily opportunities arise. They should make appropriate comments to call keen attention and awareness to examples of effective communication whenever they occur. Suitable feedback to the responsible person should occur whenever faults and omissions appear in communications. Persons with communication weaknesses should be given on-the-job training if the type of communication requirement which brings out their weakness is required in their job; or, if feasible, this requirement should be assigned to another person without this particular

weakness. Another alternative would be to use proper classification and placement in terms of communication skills, which could reduce the frequency to which on-the-job training or reassignment of communication tasks are needed.

It is strongly suspected that most communication in an organization occurs from mouth to ear, so to speak, and that very few people tend to take notes regularly and systematically in these situations. Even though strong evidence is not yet available, it is believed that the original content will be preserved to a much higher degree in a reading-writing than in a speaking-listening type of transmission. The message recorded on paper is probably more lasting than that merely committed to one's mind. In other words, slogans used in some offices, such as "don't say it--write it" will probably be found to be sound when tested empirically, if preservation and undistorted transmission of content is the aim. One price to be paid for such communication is that it tends to be slower and more formal.

The channels of reception and expression should be varied in the training program. The person could be required either to read or to listen to the given message. In some instances he should be allowed or even required to take notes whereas in other instances he should not be permitted to take any notes. He should have practice in expressing given messages both by writing and by telling them to others. Even more important, all reception-expression combinations should be practiced until the person has attained a desired standard of proficiency as a transmitter in each combination. Since so much of the actual communications in an organization are "by word of mouth" and since losses and distortions tend to be very great in this nonrecorded combination of listening and speaking, special attention and practice should be given to this transmitting combination. In cases where persons are too inefficient as transmitters, special steps should be taken to see that they are not placed as crucial links in the organization's communication system. The communication system might also be designed so that when crucial messages are to be transmitted, human communicators will be "engineered out" of the transmission system in so far as possible.

In group situations it has often been observed that some people talk more than others, though many of them are judged not to have said much. We suspect that some persons are fluent producers, others are anxious uncontrolled talkers, while some at the other extreme are quiet nonproducers or restrictive, over-controlled precisionists. In the briefing activities that occurred through the Classroom Lecture situation, it was found that there was only a low, hardly significant positive relation between the accuracy and completeness of briefing with the interestingness of the briefing.

This represents a vital difficulty in communications. Steps need to be taken to train speakers to satisfy simultaneously the two requirements of correctness and of interest in transmission. In other words, we must either seek out the rare exception or else train most other persons who have or will have positions of responsibility to report the truth in such a way that it is interesting.

High level supervisors should be aware of the importance of accuracy in communications and of the differences in the tendencies of people to resist the reduction of ideas. If precision in transmission of ideas to others is desired, one could identify those who will strive to preserve the content of the original message. It is clear that this tendency functions to some degree when the original message to be transmitted appears in writing. There may be additional variables functioning when the message is presented orally and is received by a listener. Differences in note-taking tendencies and note-taking skills can also be present, which can further confound the picture.

The evidence is quite strong that persons serving as communication links in an organization should be given more training in the sheer transmission of messages. Such training programs should include the use of good measuring devices, with prompt feedback of the result to the trainees. The measures should probably include both quality and quantity scores in the transmission of the total message. Various transmission tasks should be included in order to represent what actually occurs on the job. The nature of the initial message should also be varied to insure awareness of the importance of transmitting a variety of messages for various purposes. In some cases the initial message should be in high level or technical language with the requirement that the trainee transmit the content of the message but express it in simpler, non-technical form. The reverse should also be tried in which the trainee must start with simplified form of a message and transmit it in technical or other high level language form.

We suspect very strongly that the typical style currently used in presenting information in scientific literature and at scientific meetings at times approaches a rather deadly, formal one almost resembling "gobbledegook." On the other hand we feel that through some deliberate attempts (guided by research check ups), we could soon learn how to rewrite the same information so that it could be prepared in various other styles, one of which might be found to be the most provocative style of presenting the given information. Then our hunch would be that the most provocative style of presentation would prove to be far superior to the usual journal styles, not only in stimulating thinking but especially in affecting positively the work of scientists and increasing



the likelihood of their using this information to help them move ahead more effectively in their work. In other words, we believe that it would be very worthwhile to attack this problem of style of presentation, with the hope that we could learn how to maximize the productive thinking and perhaps even the creative thinking of scientists who were exposed to given information.

Our strong hunch is that most persons have little capability in changing information from a formal to a provocative style. Contrarily, we suspect that human capabilities that are currently cultivated and widely functioning would serve quite well to change information that is already in a provocative style into a much more formal, formidable, and uninteresting style.

In training in sheer transmission activities, central processes and personality effects should be at least minimized or preferably ruled out. Otherwise, most communication training, after the simpler introductory phases, should emphasize central thought processes and combinations of communication channels, rather than remaining strictly at the level of emphasizing, one-at-a-time, such activities as writing or speaking or reading or listening. In the training program one may work gradually from specific channels toward the more complex combinations and the central processes so that ultimately the largest emphasis should be on central processes rather than on specific channels.

The general findings suggest that when one is seeking a good communicator he is thinking primarily of a person who has good central thought processes, who has some efficiency in receiving and sending ideas, and who has a number of the relevant personality traits. The quality of the person's message is also important as he receives and transmits messages in a cross-section of communication tasks.

When the central nervous system and especially the brain areas are studied in terms of their functioning during communications, many centers or small regions or relevant localized activities are found to be functioning collectively. During higher level communication activities several of these sensory, associative, and motor areas are functioning in a teamwork fashion. Therefore, the finding of great complexity in human communications is strongly consistent with the great complexity of the brain structures as well as with the complexity of brain localization wherein several of these areas simultaneously function and interplay during typical communication processes.

Potential high level administrators should be taught flexibility in its variety of forms, organizing abilities, fluencies, and editing skills because of their general usefulness across communication tasks. In fact, the higher the level for which a person is being trained, the wider should be the variety of communication tasks in which he should be trained and the higher should be his general skill requirements across these tasks.

To fulfill some of the highest level activities in an organization and in life, a person must be an all-around communicator. In other words, he would need a high profile across the multiplicity of independent communication abilities. This is a difficult requirement, and the probabilities are strongly against a person's scoring consistently high across so many independent variables that do not cluster together normally, as a consequence of either heredity or experience. If most communication skills are trainable, as some evidence would indicate, then some persons with high aptitudes in only some areas could attain a consistently high profile through diligent, focused training over long periods in the areas of weaknesses.

The all-round communicator who is so valuable at higher levels might be required at different times to be flexible, critical minded, fluent, a good listener in each of the many possible ways of listening, skilled in skimming, outlining, abstracting, in compact expression, and in extemporaneous or prepared writing and speaking. To be able to do all these with skill and finesse and to perform other communication activities not mentioned is a difficult assignment rarely fulfilled by one person. A team of communicators might do better by requiring each team member to accomplish the few activities in which he is most skilled so that no one would perform a task in which he was truly weak; however, there would remain the major communication task of coordinating the entire team and its total communications.

This project emphasized the importance of research teamwork between psychological measurement specialists and subject matter specialists from English and speech. Such teamwork should again be developed and utilized if appropriate training activities are to be devised. For these research team members, the most stimulating and fruitful periods were those early in the program when broad uncurtailed planning, free exchanges of ideas, and creation of new tests occurred.

The ability to assume a response set that facilitates flexible performance is an asset in many communication situations. This fact could be pointed out and attempts could be made to train persons toward more favorable response sets, in order to make them better

communicators and thus better coordinators, instructors, and high-level personnel. Two relevant response sets that were measured and described in this project were Spontaneous Flexibility and Broadly Diffused Attention. These may also be conducive to original and creative responses.

Classroom instructors as well as on-the-job supervisors who attempt to cultivate original and creative responding should be alert to the importance of good communications. In fact, both supervisors and instructors should be selected in terms of certain communication abilities as well as being trained in communication skills. Classroom instructors must perform many of the tasks represented in the situational tests. The preparation and delivery of the classroom lecture, oral reading, instruction on the job, arranging outlines, comprehending manuals and texts, preparing and editing written instructions for trainees, and conducting and participating in conference like seminars are all activities required of instructors which were included in the Battery C situational testing. The correlates with these criterion scores in Battery C yield much information useful in the selection and training of instructors as well as increased insights into the instructional process. Since classroom learning entails both reading and listening, persons serving as instructors should learn more about how to express themselves orally as well as in writing in order to get their message across most efficiently to the receivers.

One of the problems that arise in giving instructions as well as in other communications is the difficulty in expressing exactly what one really means. While some of this difficulty can occasionally be attributed to shortcomings in the available language, it may also be due partly to lack of mastery of the tools of the language, and to insufficient associations to bring up promptly the best words needed to express the desired thought. Another phenomenon may occur in the process. As the thoughts are made explicit and as their expressions are edited and reworked, not only the expressions but also the thoughts may become clearer. Saying what one means is not unrelated to its converse of meaning what one says. If one rapidly edits his own expressions, he may find that he must restate his expression several times in order to be saying what he means and therefore, meaning what he says. Training drills could be established which would provide practice in self editing and reworking one's statements to eliminate misstatements and ambiguities so that what was finally expressed corresponded with what was meant to be expressed.

In contact work in an organization one needs skill in establishing good rapport so that messages can be delivered and exchanged effectively. Some persons have the necessary flexibility

and skill to keep the communications channels open so that neither they nor the other persons cut off the exchange before the necessary messages have been transmitted whereas others at times rapidly create situations where it becomes almost impossible to continue the exchange or deliver any messages. The efficient management of these difficult but sometimes crucial situations undoubtedly calls into play many communication abilities. Training in maintaining such rapport could be accomplished in situational tests and in role playing activities. Sales work is one strong example of contact work that is highly communicative in nature. The abilities involved in sales activities should interest all organizations since all jobs can involve at least the selling of ideas and suggestions which could improve the organization.

The alternate role of retaining rapport with persons attempting to sell articles or ideas is also crucial. There are times when it is vital for a person to be psychologically ready to listen and learn about a new idea or article. Great communication skill and tact are needed not to diminish chances for good rapport next time nor to reduce the other persons motivation when it seems advisable not to "but his article or idea this time."

Listening is an area that has been relatively ignored in the past even though skill in listening may be one of the most crucial abilities in classroom and on-the-job learning. Traditionally, schools have trained people in reading, writing, and speaking, (though not in talking) but have automatically assumed that no major differences in listening exist so that little attention has been paid to this area. It is now evident that listening is a complex field without much generality permeating the total listening area. Consequently, in order to identify and cultivate the particular listening abilities that are relevant, it would seem wise at present to build tests and training programs which entail listening activities required on the job. Because so little attention and study has been focused on the variables and processes of listening and on listener characteristics, some training in listening skills is certainly warranted. Attempts at quality scoring of the listener's performance should be included in the training program. The psychology of the listener and of the entire listening audience should be stressed and illuminated in the training program, since most of the attention has heretofore been given to the speaker's abilities and characteristics. Similarly, attention should be given to the psychology of the reader and the reading audience, to counterbalance more evenly the usual emphasis on the skills in writing.

Perhaps some examples of other listening tasks will illustrate the diversity of the listening area. These examples are in



addition to the five listening tasks used in this project. One task which has developed as an outgrowth of transcribing our creativity research conferences may be referred to as "prooflistening." After a typist has transcribed the tape recording, the task is for another person to check the transcription against the recording. With this kind of listening, accuracy is paramount. Another skill in listening is to be capable of capturing only the key points, messages, clues, etc., as in skimming in reading.

While listening is occurring, other thinking processes may be needed or may merely be going on "in the background." Some of these other thinking processes may tend to interfere with listening if one is not well practiced. While listening, one may be actively recalling past experience or knowledge, criticizing, judging, speculating, imagining, thinking beyond what is said, in order to create, rather than merely recording what is heard. Perhaps this creative thinking while listening is radically different from the process of passive apprehension, and more difficult to accomplish.

In contrast with listening, which is so much neglected, writing is given perhaps more attention in school than any of the other channels of communication. Compared to the other expressional channels, writing probably is more taxing intellectually. The speaker's voice inflections, gestures, facial expressions, etc., can help to convey the exact meaning, but the writer is deprived of all such histrionic resources. In writing, meaning must be shaped and ambiguities must be precluded solely through the arrangement and punctuation of visual symbols of words.

Purposes in writing are many; so also are the means of accomplishing them. We may write to express ourselves, to entertain, to transmit information, to provoke thought, to stimulate discovery or action. The nature of the purposes tends to determine the style and the qualities of the writing, if the writer has sufficient skills and flexibilities to change his writing accordingly. Let us turn to a couple of illustrations where different writing processes and abilities are extremely crucial.

One kind of problem can arise when, as so often in physical science, we are faced with both mathematical symbols and words. Suppose it were necessary to translate a mathematical formula or a figure in geometry into words, in preparing instructions for someone to follow. Or suppose the translation went in just the reverse direction. In both cases, of course, precision would be vital as part of the translation skill.

Recently an important point was brought to our attention by a publisher. It is many times more expensive to prepare and print

a table or figure than the same amount of page print. If verbal description or exposition may be substituted for a table or figure, without a loss of information, then the more economical presentation seems justified. Ability to formulate information in alternative ways is worth identifying.

Another form of writing activity involves corrections and revisions, as in editing written or recorded material. A most difficult task is to work with someone else's material. Just what the author means and what he has actually said may be at a variance. It is helpful if the reader knows the idiosyncracies of the writer. But, more often a writer and editor are total strangers. Correctness and lucidity are prerequisite, yet they may be achieved in alternative ways. At times, the editor must try to preserve a given style.

The role of the editor is unique. Not only must he be able to read and respond to a variety of writers, but ordinarily he must deal with a variety of materials or content. An editor must correctly sense what the writer is attempting to communicate. He may then suggest a more effective way of stating it without changing the original or intended meaning or style. Or he may help the less competent writer to improve his procedure and to develop a more effective style.

Communication tasks in all jobs tend to be somewhat complex, and each one involves a particular combination of communication abilities and traits. In higher level jobs, the communication tasks tend to become more numerous as well as more complex, so that the total set of abilities required for success comprises a combination of many different communication skills. In the entire organization the number and variety of communication tasks is often very large. Throughout the organizational structure, a great variety of communication skills are required if its communication system is to function efficiently.

For purposes of simplicity, these communication tasks can be grouped into related families of tasks, as has been done in the current study. This project has successfully identified a standard set of communication abilities and traits that underlie (in a representative fashion) successful performances across typical communication tasks in an organization. The results also indicate which subset of these abilities and traits is needed in each of the communication situations included in the final validation study. From the voluminous results in the project, many other implications for the training and utilization of these communication abilities are also mentioned and discussed. In addition, there are undoubtedly numerous other practical implications in this vast mass of data that have not yet been mentioned explicitly.

It is felt that the present project has been a successful exploratory one and that it should be followed not only by implementation attempts, as mentioned above, but it should also lead to additional studies of two types. First, further explorations are needed not only in unreached areas within the broad domain studied to date but also expanding beyond these boundaries into other heretofore untouched areas. And secondly, a large number of narrower studies of a tighter design should be undertaken which will attempt to verify and make more precise the findings in the present project. Both types of studies should be done, since they could be very valuable and illuminating.

We have been intrigued about the possibilities of doing studies on the effects of different styles of information presentation on the recipients. Particularly, we have been interested in different degrees of provocativeness of information presentation and are also curious about the various human talents that are needed to produce information in each of different styles. We strongly suspect that the talents functioning most frequently today tend to be those that can change materials from a provocative to a largely non-provocative style--in contrast, we think that there are but a few rare birds who can change information from a non-provocative to a provocative style of presentation.

We are also challenged by the research findings that highly creative ideas tend to encounter considerable trouble which often means that they have run into someone else's plans. At such times, communication barriers frequently arise rapidly and are customarily backed up by strong emotional defenses and inflexibilities. We are therefore pondering about such fascinating topics as creativity versus planning, about the flexibility of plans and of planners, and about the receptiveness of planners to new ideas after they have crystalized their plans. All these questions strike into new and important research areas concerning creative abilities and communication abilities.

During the past several years, Taylor and Ghiselin have written various theoretical essays on creative abilities and communication abilities on such specific topics as the creative process and education, knowledge and creativity, learning and reading creatively, listening creatively, creativity and expression, processing information for creativity, productive thinking in science education, communication in art, and the creative process in communication. Though these theoretical essays are largely unpublished and only partly based upon empirical findings, they do represent our best thinking beyond the research studies reported herein. They also represent other products and outcomes of the project which we have

generated as a result of our sustained thinking on communication abilities.<sup>8</sup>

An earlier speculative chapter on some possible relations between communication abilities and creative abilities suggested that there can be creativeness in reception, creativeness in central processing, and creativeness in expression in communication activities (Taylor, 1963). The chapter then ended by pointing out that research on communication abilities certainly provides a potentially fruitful approach to the difficult problem of understanding and identifying creative talent. It is felt that the present project has taken one important step forward in fulfilling the above promise of increasing our insights about creativity and its measurement through these many explorations into communication abilities in action.

Our final thoughts from all these efforts are that we continue to be convinced of the vital importance of both communication abilities and creative abilities and we have become increasingly aware of their great complexity. We therefore urge that further research and development work be undertaken so that society may soon have available all the benefits that can accrue from increased insights into these human talent areas and from improved techniques for identifying, developing, and utilizing these abilities.

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<sup>8</sup>We were fortunate, in addition, to have available for study a tape recording (which we transcribed) of a similar theoretical speech by S. I. Hayakawa, the eminent semanticist, on the general topic of creativity in language.

After we completed the present large research report we also uncovered an interesting finding in the fourteen year summary of research on fellowship selection reported by Lindsey R. Harmon (1966) on the program which the main author of the present report initiated in the National Academy of Sciences--National Research Council. There was a correlation of .25 between citations for excellence in teaching in one's professional career and ratings on communications ability in the reference reports submitted at the time of fellowship application. While this correlation is modest, it is rather high for that of a single specific rating on college students with citations on their teaching excellence many years later.



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## APPENDICES

- I Factor Analysis of Battery A Scores: Detailed Results
- II Factor Analysis of Battery B Scores: Detailed Results
- III Tables . . .-50
- IV Factor Analysis of Battery C Scores: Detailed Results



## APPENDIX I

### FACTOR ANALYSIS OF BATTERY A SCORES: DETAILED RESULTS

Chapter IV described the Battery A scores, which are all essentially of the paper-and-pencil aptitude type. In the fifth section of that chapter the Battery A factors are listed and discussed in a general way. The details of the factor analysis will now be presented in this Appendix III.

Because of computer limitations at the time of this analysis, the 65 scores were reduced to 51 scores to eliminate experimental dependence and consequent spurious factors. Two independent methods were used in seeking a rotational solution for these 14 factors. The first solution was arrived at by machine methods using Thurstone's analytical rotational solution (1953) on the SWAC, but some unexpected results for a few of the landmark tests raised questions about accepting the machine solution. Since this problem was the first one to be rotated on the SWAC program, it seemed that more experience might be needed to learn how to use the machine program. For example, there was no firm procedure for deciding in turn what variable to use as a trial vector in rotating each new plane by this analytical single plane method.

As a consequence, a second rotational solution was done by hand, using the Zimmerman Board Technique for orthogonal rotations (1946). This provided plots which could be checked visually throughout the entire rotational work. It was thus possible to follow carefully the location of various landmark tests during the rotations. Nevertheless, the results on some landmark tests were still contrary to expectations, being similar to the results of the machine rotations.

The present orthogonal solution contains almost all test vectors in the positive manifold, and this graphical orthogonal solution was undertaken as a double check because the results from an oblique rotational solution showed these same landmark tests to be factorially complex rather than factorially simple.

On the following pages an attempt has been made to interpret nearly all of the 14 rotated factors. The three columns of information in each case are the score number, the predictor score, and the factor loading (as shown in the headings for the first factor).

Factor A: Expressional Fluency. The tests which have high loadings on this factor are as follows:

<u>Score Number</u>	<u>Predictor Score</u>	<u>Factor Loading</u>
30	Letter Star II--1st resp.	.48
9	Letter Star I	.42
52	Letter Star III--2nd ex.	.42
51	Letter Star III--1st ex.	.38
59	Theme	.36
25	Word Story--words used	.32
61	Skimming	.32
31	Letter Star II--2 & 3 resp.	.31
7	Similes I--total	.30
48	Sentence Bldg.--1st sent.	.30

It is noteworthy that these scores did not appear strongly on many of the other fluency factors in this study and did not cluster together on any other factor. The Letter Star tasks call for flexibility in modifying expressions of ideas as well as in modifying the ideas themselves. The second landmark test of this factor was Similes I, which loaded .30 on this factor. The other tests expected to load on Expressional Fluency also appeared, including Word Story, Sentence Building, and Sentence Fluency (with a loading of .22). Nearly all other scores with significant loadings, including 14 scores with loadings in the .20's, were derived from tests of written expression, but did not require the facility and flexibility of expression as much as the Letter Star tasks. Thus, this factor is interpreted with confidence as Expressional Fluency.

Factor B: Associational Fluency. The tests which have high loadings on this factor are as follows:

21	Telegram Writing II--words/idea	.55
22	Word Assoc.--total	.53
5	Suffixes	.51
6	Association (Two Way)	.50
8	Vocabulary	.48
2	Naming States	.47
50	First and Last Letters	.40
54	Comp. Words II--total	.38
3	Sentence Gestalt--corr.	.36
26	Word Study--interest	.36
38	Revision I--corr.	.36
35	Comp. Words I--total	.35
29	Verbal Classification	.34
53	Completion	.34
1	Naming Names	.33
27	Similes II--1st resp.	.33
39	Revision I--incorr.	.33
4	Sentence Gestalt--omit	-.39

The landmark tests measuring Associational Fluency have two of the highest loadings on this factor. To date, Associational Fluency has appeared in only verbal tests dealing with verbal meaning and form. Whether it will appear in non-verbal materials remains to be determined empirically. The Word Fluency tests also have at least moderately high loadings, as do the two landmark tests for the traditional Verbal Knowledge factor. It is unfortunate that more landmark tests were not used per factor, for that might have resulted in a clearer separation of Word Fluency from Associational Fluency. This factor is interpreted as the traditional Associational Fluency factor, with the finding that part of the variance in the Vocabulary and Completion tests of the Verbal Knowledge factor can be meaningfully attributed to this factor.

The Word Association test is a loose synonym test in the sense that the examinee is given a slightly-structured task of writing as many words as he can that are "somewhat like the given word in meaning." Thus, a score can be a function of two aspects: (1) the total number of associations that the individuals can think of that are acceptable as closely related to the given word and (2) the number of associations that individuals allow themselves to write as a result of a higher degree of uncritical-mindedness. In other words, in the first case the score is dependent more on the knowledge of many words more closely related in meaning. In the second, an individual need not know many words closely related in meaning, but the individual may simply "accept," or write as acceptable, words that are more remotely related. The emphasis is not necessarily on the production of words that are perfectly analogous in meaning to the given word, but the production of any related word, however imperfect the analogy or similarity in meaning may be. In a sense, it is an awareness of some similarity amid differences in meanings. Presumably the more associations tied to a word and the more a person is willing to work at a crude level of analogy or similarity, the higher will be his score on Associational Fluency tests. Unfortunately, either fact by itself can account primarily for a high score. In order to determine whether the sheer number of associations or the degree of uncritical-mindedness is primarily responsible for the score, it would be necessary to inspect the test papers and develop scoring systems of a type not yet utilized. For example a remoteness index and popularity-of-use index could be used.

The high loading of the ratio score of number of words per idea in the Telegram II test deserves some explanation. In this test, the person was restricted to a maximum of ten words in his telegram. If he were working at a loose level of precision, as in the case for one possible response set in Associational Fluency tasks, he might tend to be wordy and receive a high ratio score even though the Telegram test inherently emphasizes brevity, compactness, and pre-

cision in expression. In terms of the stringent level of precision, so many associations may be drawn that fewer words would result in a deletion of apparently relevant material.

Factor C: Listening Comprehension. The tests with high loadings on this factor are as follows:

15	Consequences--total	.51
13	Auditory Retention	.43
53	Completion	.36
8	Vocabulary	.34
6	Association (Two Way)	.32
17	Telegram Writing I--words	-.30

This factor is tentatively interpreted as Listening Comprehension, partly because it resembles the factor more clearly supported as Listening Comprehension in the next Battery B, and because Auditory Retention had next to the highest loading in the present factor. The two vocabulary tests loaded moderately on this factor, as was also found in the comparable factor in Battery B. The Telegram I word score, with less emphasis on minimizing the number of words than in Telegram II, was loaded low negatively on this factor. This result suggests that a person with good comprehension of verbal material can use fewer words in expressing his ideas than a person who has either poorer comprehension or a smaller storehouse of readily available words. This loading is similar to the negative loading for the Revision II ratio score on the corresponding factor in Battery B. The high loading on the total number of low quality, direct consequences may mean that the person who is a good receiver of common information can readily name many commonly expected consequences. The loading of Two-Way Associations suggests that the effective receiver of communications quickly senses and thinks of more than one possible meaning in an ambiguous situation. Speech Sound Discrimination, the other listening test in the battery, had a small loading in the right direction of only .15, which indicates its relative unimportance in this present factor.

Expression tests present on this factor are those in which a person will score high if he has a fullness of associational connections of usual (not remote) implications. The person must also have a facility in utilizing these common associations, so that they are readily available not only for listening and reading comprehension, but also for recall and production purposes. In this factor there is some emphasis on precision in comprehension and in word usage. Many of the above relationships suggest that the factor entails an ability to shift from one item of meaning to another. As further analytical studies are accomplished in the



listening domain, some of the above questions in interpretation should be tested for clarification. It should be recalled also that tests of reception, especially of listening, are not as well represented in any of the present batteries as are the tests of expression.

Factor D: Verbal Knowledge (or Verbal Comprehension). The tests which have high loadings on this factor are as follows:

8	Vocabulary	.50
53	Completion	.48
22	Word Assoc.--total	.39
12	Spch. Snd. Discrim.	.38
59	Theme	.38
61	Skimming--items	.38
41	Revision II--words	.36
2	Naming States	.35
25	Word Story--words used	.35
26	Word Story--interest	.35
13	Auditory Retention	.35
62	Outlining I	.34
64	Abstracting--words	.33
31	Letter Star II--2 & 3 resp.	.32
54	Comp. Words II--total	.32
3	Sentence Gestalt--corr.	.31

This factor is interpreted as the traditional Verbal Knowledge (or Verbal Comprehension) factor, with some new emphasis on the understanding, extraction, and expression of given ideas in a task with a certain amount of structure where there is neither a great deal of ambiguity nor a need for very great precision in understanding or expression. Or alternately, it might be interpreted as sensitiveness to verbal meaning and to form. Sensitiveness to form occurs in both auditory and visual tests and loads more heavily where there is a familiar rather than a distorted background. This present factor is different from the later Ideational Fluency factor, in which one is not given the specific ideas but must generate most of the ideas produced. Nearly all of the tests having significant loadings on this factor require the recognition, extraction, and production of a word or phrase which has a meaning given by its context.

The two landmark tests of Verbal Knowledge have the highest loadings on this factor. This new factor seems to be complex, since some of the landmark tests measuring Associational Fluency and Ideational Fluency appear on it, too. The two vocabulary type tests call primarily for recognition of meaning, although one of them also requires the person to produce the correct answer. The appearance

of the two listening tests on this as well as on the previous Listening Comprehension factor is somewhat troublesome to interpret, but may indicate their fundamental complexity. A knowledge of words, including their spelling and pronunciation, should facilitate selection of correct words in the Speech Sound Discrimination test. The Word Association test requires a person to produce a series of words that he has recognized as being somewhat similar in meaning to a given word. The Theme test calls for the production of discourse with at least a minimum level of meaning. This Theme score, which has usually provided an Ideational Fluency landmark, did not appear on any of the three fluency factors in this study that resemble the traditional Ideational Fluency factor. One reason why it may have appeared here instead is due to the regional differences in meaning of the word, a "parcel," about which the Theme was written. This topic for the Theme bothered several examinees from one region of the country because of its typical use there in connection with a "parcel of ground."

It should be noted that several of the above tests calling for extraction, recognition, and production of meaning within a given, well-structured context had zero loadings on the Associational Fluency factor.

Factor E: Resistance to Idea Reduction. The tests which have high loadings on this factor are as follows:

16	Telegram Writing I--ideas	.63
17	Telegram Writing I--words	.47
18	Telegram Writing I--words/idea	.45
29	Verbal Classification	.35
3	Sentence Gestalt--corr.	.33
6	Association (Two Way)	.32
38	Revision I--corr.	.30

This factor is in some respects the newest and most different in Battery A. Most of the tests with a sizable loading involved some degree of reduction in the amount of material communicated. These tasks called for the expression of as many given ideas with as few words as possible. However, scores in these reduction tasks, such as in writing telegrams and revising wordy materials, were usually quantity scores, so that the larger the score, the less the reduction. These quantity scores generally correlated positively with other scores in this battery, with its stress on quantity scores in written expression tasks. The number of ideas retained on Telegram Writing I had by far the highest loading on this factor, followed by the number of words used on the same test. One interpretation is that this factor measures the degree to which a person stresses accuracy and completeness of communication in a

task even though compact expression is requested. In other words, such a person is disinclined to make expressions too compact and thereby too complex. Instead, he resists too much reduction, for he tends to retain the original ideas and is still somewhat wordy in his expressions, in spite of the fact that the task stresses a reduction, especially in the number of words. Apparently the attention of the examinee in tests of this factor is focused more on ideas than on words, since one positive correlate with this factor was the tendency to score high on Revision I by striking out in sentences the words not needed to put across the ideas. Thus, the factor could be alternately interpreted as involving "Succinctness of Expression," primarily with a respect for the integrity of meaning together with verbal economy.

The factor is not as clearly defined as one would like. Other tests of compactness of expression such as Telegram Writing II, Revision II, Outlining, and Abstracting did not emerge as high predictors of this factor. Further research is surely needed in the total area of reduced expression to include tasks entailing reduction of ideas or of words or of both ideas and words. In order to understand the various phenomena in both expansion and reduction types of expressional tasks, an attempt should be made to design good measures of the degree of critical mindedness of an examinee, to show his tendency and ability to weigh and screen not only ideas but also expressions prior to their release.

Factor F: Ideational Fluency. The tests which have high loadings on this factor are as follows:

28	Similes II--2 & 3 resp.	.64
7	Similes I--total	.55
44	Similes III--2nd phrase	.55
43	Similes III--1st phrase	.51
36	Sentence Fluency--total	.48
10	Topics--quantity	.45
46	Brick Uses--total	.45
15	Consequences--total	.39
22	Word Assoc.--total	.34
54	Comp. Words II--total	.34
1	Naming Names	.32
25	Word Story--words used	.32
59	Theme	(.25)
27	Similes II--1st resp.	(.24)

This factor requires the production and expression of ideas in meaningful discourse where the task is usually loosely structured and the meaning requirements are minimal. It includes the production of meaningful responses either across a series of different

items or all produced on one single item. Low quality ideas are adequate responses if a person is willing to express them. The more idea-fluent person is likely to respond to a semistructured situation by producing 2nd and 3rd idea responses to a particular item, instead of skipping to a new item after giving his first response. Topics and Brick Uses have loadings of .45 on the factor; it seems that this factor is the traditional Ideational Fluency factor, since these are two landmark tests of this factor. Theme, the third landmark test for this factor, has a low but significant loading of .25.

All five scores on the four Similes tests have high loadings on this factor, too. Since Similes I in a previous study had a higher factor loading in Expressional Fluency than in Ideational Fluency, an analysis of all similes tasks and scores seems to be required, since four similes scores had the highest loadings on this fluency factor. The second and third responses score on Similes II, with the highest loading of .64--which is higher than usually found for Ideational Fluency--demands that one produce many diversified ideas, expressed as simile completions, in response to a stimulus phrase. Since this score measures only the 2nd and 3rd responses, it supports the other evidence that this is Ideational Fluency--the ability to produce a quantity of ideas in response to a fairly loosely structured stimulus phrase. The ability required in this score is one to produce additional responses after the initial one to a given stimulus. This score is therefore highly recommended for future use as a landmark for this factor.

Both parts of Similes III had high loadings on this factor, which is reasonable since they call for the production of as many similes as possible in response to a single stimulus phrase. These two scores are similar in certain respects to the sum of the second and third responses of Similes II, since all three of these similes scores require the production of many completed similes from one given incomplete simile.

This factor appears to be a measure of the ability to sustain production; the sheer number of responses being crucial. Most of the other tests loading high on this factor require the ability to produce a great many ideas about specific topics and to express these ideas in meaningful discourse. In previous appearances of this factor, the listing of single words according to their meaning (but not according to their structure) also loaded on this fluency of ideas factor, but in the present study they loaded instead on the next factor.

In Sentence Fluency apparently the task is one of producing a variety of "specific-idea" approaches to expressing essentially the



same general idea. Apparently the task is not as much a re-expression of exactly the same idea in different words as it is an ability to find different specific ideas about the given general topic.

The tests which have low or zero loadings on this factor also help define this Ideational Fluency factor, since most of them require recognition or production responses which must be made within a highly structured frame of reference.

Factor G: Idea Listing Facility. The tests which have high loadings on this factor are as follows:

46	Brick Uses--total	.50
43	Similes III--1st phrase	.45
51	Letter Star III--1st ex.	.33
48	Sentence Bldg.--1st sent.	.30
50	First and Last Letters	.30

This factor seems to be another fluency factor because the Brick Uses score used as a landmark measure has a high loading on it. This Brick Uses score quite surprisingly had loadings on three fluency types of factors. Similarly, the other four Ideational Fluency landmark tests have loadings on from two to four fluency factors. However, the other landmark measures of Ideational Fluency did not appear strongly on this factor. For example, the total number of words on the Theme test had a loading of .25 and the Topics quantity score had a loading of .18. It seems that this factor may be an ability to generate and list a series of relevant ideas. It involves a rapid production and listing of ideas. Each idea can usually be expressed in a very few words, and often in only one word, so that any requirement of expressing ideas in more lengthy phrases or sentences is minimized. Usually there is only one broad set, one broad task within which one produces and lists as many ideas as he can, whereas in the previous factor of Ideational Fluency, ideas often have to be produced in turn for each of a variety of different items, and more than a mere listing is usually involved. Some tests not included in the present study which would be expected to load on the present idea-listing factor are the listing of Things Round, Things to Eat, and adjectives that could be used to describe a mountain, in which there is practically no requirement for producing connected discourse. One of the Word Fluency tests also had a loading on this idea listing factor. In summary, this factor is interpreted as an Idea Listing Facility usually measured within one fixed broad task in which the responses involve a listing of as many relevant ideas as possible, with little or no requirement to produce connected discourse of any great length.

Factor H: Spontaneous Flexibility. The tests which have high loadings on this factor are as follows:

46	Brick Uses--total	.43
47	Brick Uses--categ. chgs.	.37
49	Sentence Bldg.--2nd sent.	.36
44	Similes III--2nd phrase	.32
48	Sentence Bldg.--1st sent.	.30

This seems to be another factor involving fluent production, which accounts for some variance in three of the five landmark tests for Ideational Fluency. Total responses on Brick Uses had a loading of .43 and the other two landmark measures of Topics (quantity) and Theme (number of words) had loadings of .22 and .24, which are only moderate but at least show that they have a tendency to load on this factor. All the scores above require restructuring freely and quickly but not necessarily with any freshness. Since the Brick Uses Score on number of category changes has one of the highest loadings on this factor, it is tentatively proposed that this could be the Spontaneous Flexibility factor, since this was the best landmark score of this factor in its initial isolation. Many of the fluency tests permit examinees to produce responses working in several subareas at a time or in sequence. If at least a fraction of the examinees use this work method, then those who spontaneously move to new subareas according to some appropriate timing should obtain higher quantity scores than those who stay more rigidly in a subarea until their flow of ideas slows down greatly and they almost "run dry." Other fluent production scores, like the total quantity score on Brick Uses, would therefore be related to and partly accounted for by this presumed ability to be spontaneously flexible. All eleven scores with loadings in the .20's involve fluency of production. The fact that alternate interpretations may be possible is indicated by slight loadings on Word Fluency and Originality tests on this factor.

Factor I: Broadly Diffused Attention. The tests which have high loadings on this factor are as follows:

14	Consequences--remote	.40
2	Naming States	.35
61	Skimming--items	.35

The remoteness score on the Consequences test, a landmark score for Originality, has the highest loading on this factor. However, the Plot Titles score, a landmark for Originality, had a zero loading on the factor. Consequently, this factor is tentatively interpreted as a tendency to have Broadly Diffused Attention during tests where such a response set is possible. It is believed that the taking of

this diffused response set would tend to increase one's score on naming the states and on the skimming exercise as well as on most other 15 scores, primarily of fluency types, with loadings of .20 or above. It is well known that the recovery of a "lost" item of the mind can occur in a moment of "distraction" in place of intentional recall. This interpretation would partly account for fluency scores as well as for remote, clever, and otherwise original responses. It is also possible that this factor may be a different type of originality factor or that some other interpretation might be more appropriate. This interpretation differs somewhat from Spontaneous Flexibility in that it consists of a sustained state of diffused attention and would not entail a series of deliberate, intensive searches for responses within a relatively well circumscribed region, after which the person then moves to and focuses upon a different region for another series of responses. If this new factor of Broadly Diffused Attention involves focus, it is at least a broad area that is focused.

It is believed that the Broadly Diffused Attention factor should be highly important in many communication activities and possibly also in creativity.

Factor J: Naming Facility. The tests which have high loadings on this factor are as follows:

1	Naming Names	.40
15	Consequences--total	.37
16	Telegram Writing I--ideas	.35
31	Letter Star II--2 & 3 resp.	.35

This fluency factor requiring the production of words or minimally acceptable phrases can be called Naming Facility, since the two Naming tests had significant loadings on it (Naming States had a loading of .27). The ability to express names of existing things and to think up suitable names for ideas could contribute to the variance in many verbal production tasks. Even in the telegram writing task, one can retain more ideas if he can express words promptly for each idea. In Letter Star tasks there would be more demand for naming facility if one had to produce more than one correct response for each stimulus set of letter stars and not use the same word twice. In an ambiguous setting where one can either move on to a new set of letter stars or produce more responses per set of letter stars, it is believed that the facility in thinking up names might be an important determiner of which response set a person would adopt. The two Letter Star III tests had loadings in the .20's, which gives some further support in the interpretation of this factor as Naming Facility. An alternate interpretation is

that the factor involves conceptual supply, including the readiness with which the person can supply concepts of any kind.

Factor K: Word Fluency. The tests which have high loadings on this factor are as follows:

64	Abstracting--words	.35
50	First and Last Letters	.32
52	Letter Star III--2nd ex.	.31

This factor does not seem to be defined well enough to lend itself to an accurate interpretation. First and Last Letters imply that it measures Word Fluency, but the Suffixes test which also measured the Word Fluency factor had a loading of only .15. It may be a weakly defined Word Fluency factor, since words are involved more in terms of their structure than their meaning. Visual and auditory patterns are involved more in First and Last Letters than in the Suffixes test. The latter is like a rhyme with all the relevant pattern in one part of the word and with some meaning in the requirement. Some words with the proper pattern, like "stable," do not qualify. The two Letter Star III tests, and the second and third responses on Letter Star II had loadings above .24 and, among other things, require the production of a variety of words with the same beginning letter, so they support the identification of this factor as Word Fluency.

The Abstracting score here is the number of words used in the abstracted writing. This implies that the person is wordy in his written expressions, though it is a little difficult to sense how the traditional Word Fluency factor would be involved in Abstracting. The other scores with loadings in the .20's did not clarify the interpretation of this factor. It is unfortunate that more landmark tests of Word Fluency, the ability to produce words according to their structure, were not included in the study.

Factor L. Only Sentence Building had a high loading on this factor (.35). Consequently, no interpretation seems justified on the basis of just one test.

Factors M and N. Neither Factor M nor N has any loadings above .30. At this stage both are considered to be residual factors.

Summary: Eleven out of the 14 rotated factors have been interpreted above. These are listed below with the first seven in the list (above the dotted line) being previously established landmark factors.



Factor A Expressional Fluency  
Factor B Associational Fluency  
Factor D Verbal Knowledge  
Factor F Ideational Fluency  
Factor H Spontaneous Flexibility  
Factor J Naming Facility  
Factor K Word Fluency

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Factor C Listening Comprehension  
Factor E Resistance to Idea Reduction  
Factor G Idea Listing Facility  
Factor I Broadly Diffused Attention

Further discussion of these factors is contained in the main report in the fifth section of Chapter IV. Chapter VI also contains a listing and further general discussion of all the factors found in the studies of both Batteries A and B.

## APPENDIX II

### FACTOR ANALYSIS OF BATTERY B SCORES--DETAILED RESULTS

Chapter V describes the various aptitude, self-report, and other personality scores in Battery B. The 82 scores were reduced to 58 scores because of the limitations then present in the computer and its factor analysis program. A total of 13 factors were extracted and then rotated by computer to obtain a final oblique rotational solution, using Thurstone's analytical rotational technique (1953).

The rotated results were slightly different from the results in the orthogonal rotations of Battery A since an oblique solution taken directly from the SWAC was used in Battery B. The method required that a single test be used as a trial starting point in the rotation; and, as a result, many rotations were attempted, so that more rotated factors were obtained than there were significant common dimensions in the study. Thus, it became necessary to select thirteen of the rotated factors for the final solution. This was done by examining the correlations among all the rotated factors and selecting a set of thirteen that were fairly independent and in all probability spanned a thirteen-dimensional space. These factors were then interpreted by the staff as described in detail below. The three columns of information in each case are the score number, the predictor score, and the factor loading (as shown in the headings for the first factor).

Factor A: Ideational Fluency. The tests which have high loadings on this factor are as follows:

<u>Score Number</u>	<u>Predictor Score</u>	<u>Factor Loading</u>
45	Letter Star II--1st resp.	.46
9	Naming Names	.44
10	Naming States	.43
49	Revision II--ideas	.35
43	Similes II--1st resp.	.32
44	Similes II--2 & 3 resp.	.32
46	Letter Star II--2 & 3 resp.	-.32
13	Topics--quantity	.31
52	Brick Uses--total	.30

The quantity score of Topics, one of the reference measures of Ideational Fluency, was loaded positively on this factor. The only other reference measure loading noticeably high here was Brick Uses--minimum acceptable responses--also measuring Ideational

Fluency. Some of the highest loadings suggest that this may be alternately described as a naming factor.

On the other hand, all of the significant loadings seem to require varying degrees of Ideational Fluency for adequate performance on them, and the traditional measures of Ideational Fluency, including all Similes scores, appear on this factor. Therefore, this seems to be an Ideational Fluency type of factor, though it has some Expressional Fluency features in the Letter Star first response score.

However, the fact that Letter Star II, second and third responses, loaded negatively certainly argues against this as being a naming factor, since this score was positively loaded on the Battery A naming factor. The second and third responses score on Similes II has a positive loading, which indicates that there are fundamental differences between the Letter Star II and Similes II tasks, as far as the tendency and ability to write second and third responses is concerned. Superficially, these tasks seem to have much in common. Presumably first responses are more nearly spontaneous, involving a filling out of a pattern. But to change to another pattern requires a desertion of the first pattern and then a new filling out of another appropriate pattern. But the opposite signed loadings for the two second and third response scores show that mere changing, shifting, is not the primary element. Certainly, there is more meaning involved in writing a simile, whereas in the Letter Star task a formal requirement is held constant and the subject responds to it in one or more ways with any meaning being acceptable in each response.

Factor B: Listening Comprehension. The tests which have high loadings on this factor are as follows:

24	Auditory Retention	.50
59	Word Knowledge	.43
11	Vocabulary	.42
51	Revision II--ratio	-.33
23	Spch. Snd. Discrim.	.32
27	Interest Scales--speak	.30

It seems that this could be a comprehension factor emphasizing auditory understanding and discrimination since Auditory Retention and Speech Sound Discrimination have significant loadings. It may be that listening acuity underlies these listening performances. Word Knowledge and Vocabulary also came out high here and similarly may underlie ability to comprehend in listening tasks. The appearance of the interest-in-speaking score may indicate a person's desire to use and perhaps display the vocabulary he has acquired. The slight presence of interest in reading (.22) could be similarly

interpreted. Both of these interest scores correlate high with the listening interest score which was not retained in the factor study. It may be that reading comprehension would be highly related to this factor. The negative loading which the ratio score of number of words per idea on Revision II has here, of  $-.33$ , indicates that a person who is high in this factor has a good, available vocabulary and can use few words to express an idea. On the other hand, the person with the poorer comprehension of the ideas is less able to state the ideas briefly.

A similar factor was found in Battery A. It seems that the Auditory Retention and Speech Sound Discrimination tasks require one to "know words" in order to understand and retain information received by listening. This new factor occurs in both studies, with vocabulary scores loading on it; or, stated otherwise, Listening Comprehension accounts for some of the variance in usual vocabulary tests.

Factor C: Verbal Knowledge. The tests which have high loadings on this factor are as follows:

59	Word Knowledge	.63
11	Vocabulary	.59
73	Skimming--items	.47
10	Naming States	.43
51	Revision II--ratio	$-.38$
42	Word Story--interest	$-.32$
5	All-Round Ability--speak	.31
26	Consequences--remote	.31
49	Revision II--ideas	.31

Word Knowledge and Vocabulary had the highest positive loadings on this factor. The only other landmark score with a significant loading was the remoteness score on the Consequences test, which measures Originality (O). The two scores with significant negative loadings were the Revision II ratio and Word Story interest scores. This factor is essentially the traditional Verbal Knowledge factor. It was somewhat surprising to find that those who scored high on the vocabulary test involving the discrimination of a correct word wrote less interesting stories on the Word Story test, at least as far as the portion of the variance in this factor is concerned. This finding may be peculiar to only the Word Story task, where some examinees apparently focused more on using the given words while others focused on writing a good story. In other words, those most knowledgeable of words tended to take the response set of using up the given words more than taking the other set of writing an interesting story. It will be seen later in Battery C that the vocabulary scores correlated positively with the main writing



criterion scores. Also, the negative relationship between Revision II ratio and this present factor seems to imply that one with high Verbal Knowledge will tend to use fewer words in conveying a given idea. This suggests that the person can write more ideas in a given time, which should make for interest, unless perhaps the writing is too compact to be readily understood by most of the audience. These results raise some very important questions and point out the need for thorough studies on the relationship between current measures of communication abilities and the ability to write interesting communications.

The presence of the other scores listed above, plus the smaller but noticeable positive loadings of the Word Association total score, Social Institutions remoteness score, Satisfactory Ability aspiration level in writing, Speech Sound Discrimination, and Compounding Words II total score are also reasonable findings on the Verbal Knowledge factor.

Factor D: Verbal Originality. The tests which have high loadings on this factor are as follows:

52	Brick Uses--total	.50
53	Brick Uses--categ. chgs.	.50
65	Comp. Words II--total	.47
75	Abstracting--words	.42
46	Letter Star II--2 & 3 resp.	-.39
37	Word Assoc.--total	.36
57	Sentence Bldg.--2nd sent.	.35
13	Topics--quantity	.34
26	Consequences--remote	.33
11	Vocabulary	.31
59	Word Knowledge	.31

This factor reveals several tests which represent a variety of verbal landmark factors. Compounding Words II and Sentence Building are new tests which have loadings here. It seems that this could be an originality type of factor which might appropriately be called Verbal Originality. The landmark tests loading highest here involve Originality, Spontaneous Flexibility, Verbal Fluencies, and Verbal Knowledge. These verbal abilities may be required for the functioning of originality, especially in the tasks here, which are all in some way verbal in nature. The main new test with a high loading involves the creation of new compound words. One possible explanation for the negative correlation for the total second and third responses on Letter Star II, is that these are variations lacking in originality made by those who elect to give multiple responses per item. The original person may be less

challenged by and drawn to supplying a requirement in several similar ways, which may be somewhat boring because of its repetitive features. Actually, the first response score on Letter Star II has a positive loading of .27, which supports this idea that the original person would seek more fresh challenges by going on to new items instead of rewriting on the same item.

Factor E: Verbal Superficiality. The tests which have high loadings on this factor are as follows:

41	Word Story--words used	.53
61	Soc. Instit.--superfic.	.50
44	Similes II--2 & 3 resp.	.49
42	Word Story--interest	-.37

The positively loaded tasks seem to have two things in common, namely flexibility and superficiality of verbal response. It seems reasonable that the resulting product of a flexible, superficial performance would not rank high on interest, clarity, and originality. Contrarily, the Word Story score with the negative factor loading was the judged rating on the interest, clarity, and originality of the story written. Stated otherwise, in this factor it appears that words are produced or used on a relatively superficial basis with no great effort toward organization or continuity of thought. When the mind works in service of required meaning or in response to superficial or arbitrary demands, it is not free to flow in each and every direction as occurs in imaginative writing.

The opposite pole of this factor measures the ability to write a clear and interesting story as judged by others (English instructors). Apparently on the Word Story task, if one focused his attention on producing an interesting story, he did not use the given list of words very rapidly, whereas the reverse was true if he concentrated primarily on using as many words in the list as possible. In the latter case, his attention was more on each specific response, with no great continuity of ideas across the series of successive sentences written. It is also provocative to see that high vocabulary scores, as noticed earlier in the Verbal Knowledge factor, and high scores on reporting superficial or common changes in Social Institutions, as seen above, were related negatively to the writing of an interesting story in the Word Story task. Presumably, the person who readily writes second and third responses to Similes II tends at least slightly to be an uninteresting writer, whereas the reverse was slightly true for the second and third response score on Letter Star II. Thus, those who score high in tests with somewhat curtailing requirements are not high scorers for some reason, but score low instead, on the interestingness of their writing in the Word Story task.

The presence of the superficial changes score on the Social Institutions test suggests that this factor may be closely related to the Sensitivity to Problems factors. This may be especially true if the problems are fairly obvious ones instead of subtle ones requiring deeper insights to be sensed. Perhaps this is a Sensitivity to Superficial Problems factor. This factor certainly deserves further study.

Factor F: Wordiness of Expression. The tests which have high loadings on this factor are as follows:

35	Telegram Writing II--words	.42
33	Telegram Writing I--words/idea	.32
58	Test of Insight--achiev. mot.	.30

Some other scores having loadings in the .20's are the words-per-idea ratio score on Telegram Writing II, the words-per-idea ratio score on Revision II, the Writing Attitude score, and the Telegram Writing I idea score, which loaded negatively as expected. This factor seems to be a Wordiness of Expression factor which shows up most strongly under rigorous conditions that given ideas be expressed in as few words as possible. It seems likely that a person who uses more than the average number of words per idea has an above average need-for-achievement and a favorable attitude about expressing himself in writing. This factor may be related negatively to one aspect of empathy, since a wordy person is not sharply aware of others and their needs.

This factor differs somewhat from the factor on the Resistance to Idea Reduction in compact expressions found in Battery A. A main difference is that the "number-of-ideas-retained" scores do not appear with high positive loadings on this present Wordiness of Expression factor. Here the examinee displays wordiness, i.e., the number of words retained or used, which may be somewhat opposed to the tendency to retain all ideas. From this study there is no evidence bearing on the problem of whether this Wordiness of Expression factor is restricted to written expression or would transcend the channel of communication and be found as the same factor in oral expression.

Factor G: Self-Estimate of Expressional Ability. The tests which have high loadings on this factor are as follows:

54	Phrase Check List--pos.	.63
1	Biog. Info.--speak	.63
5	All-Round Ability--speak	.60
40	Spch. Attitude Scale	.59
2	Biog. Info.--write	.52

12	Writing Attitude Scale	.49
16	Satis. Ability--write	.47
27	Interest Scales--speak	.47
6	All-Round Ability--write	.40
47	Adj. Check List--pos.	.37

This seems to be another new factor with a strong appearance and good clustering that involves the self-estimate of one's favorable characteristics in expressional tasks of both speaking and writing types. In fact, every score dealing directly with positive self-reports on speaking and writing abilities shows relatively high loadings on this factor. Since ratings on oral expression enter into this factor more strongly than ratings on written expression, it is reasonable to expect the difference score on speaking aspiration to have the significant negative loading (-.28) found. (The higher the present ability rating, the lower the difference and thus the lower the aspiration distance.) The negative Phrase Check List score on negative factors in oral expression had a loading of -.26, and the oral drill score from sociometric ratings by peers had a loading of .22; these findings are congruent with the other loadings. The two scores with different features that appeared on this factor were the sociometric score just mentioned, which was the only score that was not of the self-report type, and the reading interest score, with a loading of .28, which was the only score on this factor not dealing directly with expression.

Factor H: Self-Estimate of Writing Ability. The tests which have high loadings on this factor are as follows:

10	Naming States	.48
81	Socio. Quest.--listen	.47
62	Soc. Instit.--far-reach.	.40
6	All-Round Ability--write	.35
59	Word Knowledge	.35
11	Vocabulary	.32
2	Biog. Info.--write	.30

This factor may be a self-estimate of writing ability, especially in terms of relevant background and skill reported. Even though some of the writing exercises did not have high loadings here, there are enough of those measures which involve writing to define it this way. The moderately high loadings of the Verbal Knowledge reference tests could be expected if this is a writing factor, and might form part of the basis for the judgment of one's ability to write. The biographical and all-round ability measures are both scores pertaining to writing. The sociometric listening score is quite highly related to the sociometric writing score which was omitted from the factor study. It may be that one who does not



listen well is one who has less in his mind to write; or perhaps listeners tend to be writers and non-listeners tend to be talkers. The Naming States and the Social Institutions scores both require one to remember facts or ideas and to write them on paper. The Empathy, Compounding Words II, and Naming Names scores had lower positive loadings on this factor. The first two would support the writing ability interpretation, whereas the latter suggests some possibility that this could be a naming factor, as measured through written expression. The other loadings, however, do not strongly support the naming ability interpretation. No other alternate interpretation has yet been discovered which explains adequately all the scores appearing on this factor. This factor is the most mixed in the Battery B study, in the sense that it contains a balance of self-rating and aptitude scores plus one sociometric score.

Factor I: Negative Self-Report on Communication Traits. The tests which have high loadings on this factor are as follows:

70	PE Scale--anxiety	.57
55	Phrase Check List--neg.	.49
71	PE Scale--lie	-.37
48	Adj. Check List--neg.	.31
40	Spch. Attitude Scale	-.30

This is a self-rating factor which might be described as a willingness to report negative aspects about oneself, especially in admitting anxiety and other personal characteristics that might arouse anxiety. The manifest anxiety score from the PE scale, the negative Phrase Check List score on speaking abilities, and the negative Adjective Check List score on writing abilities all load high and are all self-rating scores which reflect negative attributes. One positive self-rating, the Speech Attitude Scale, appears with a negative loading, which may be interpreted to mean that those who report that they have comfortable feelings when giving speeches may tend to be either less anxious or less willing to report honestly on fears and negative personal characteristics when they arise. The lie score of the PE Scale has a loading of  $-.37$ , which is consistent with the above interpretation, since a negative loading on this factor represents a dishonesty or unwillingness or inability to report on one's shortcomings.

Factor J: Aspiration in Communication Abilities. The tests which have high loadings on this factor are as follows:

20	Diff. Score--write	.78
22	Diff. Score--listen	.67
16	Satis. Ability--write	.66
21	Diff. Score--read	.64
19	Diff. Score--speak	.63

This factor reflects the relative amount of aspiration one has in the overall communication area. All difference scores between the self-ratings or minimum satisfactory ability and on all-round ability had significant loadings on this factor. This seems to be a factor which measures one's desire to better himself in the four major areas of communication, especially in relation to one's present ability, or at least with regard to the ability he feels he presently has. For each type of communication ability, every person in the study rated himself higher or the minimum level of ability with which he would be satisfied than on his present ability, so the difference score between these two was always a positive score. The interpretation given here is: "the greater the difference score, the greater the aspiration to improve in that particular communication ability."

The only score on the Satisfactory Ability Scale (Writing) that was retained explicitly in the Battery B factor study also appeared strongly on this factor. Since the four scores on the Satisfactory Ability Scale were all intercorrelated in the .70's, they would all probably appear strongly on this factor. This factor entails absolute level of minimal aspiration as well as the relative aspiration distance to a satisfactory level. The higher the absolute level of minimal aspiration, the greater is the aspiration distance to a satisfactory level.

Factor K: Empathy. The tests which have high loadings on this factor are as follows:

63	Empathy Test	.49
10	Naming States	.45
11	Vocabulary	.32
59	Word Knowledge	.31

The fact that Empathy and Vocabulary load on the same factor implies that the Empathy score is related to certain verbal performances, including the accumulation of good vocabulary. As a result of a small unpublished study in a University of Utah English class, William R. Smith reported in a personal communication that there was definitely some correlation between total English scores and the Kerr Empathy scores. Some support for interpreting this as an Empathy factor is found by examining some of the scores with factor loadings in the .20's. Those with the highest scores on

Qualities of a Superior Speaker tend to overrate the characteristics of superior speakers and thus show poor empathy, as indicated by the correlation of  $-.29$  between these estimates of what superior speakers are like and the Empathy Test scores. The loading of the manifest anxiety score of  $-.22$  on this factor also makes sense, because the less anxious person should be freer and more capable of empathizing with others. The rating by peers on listening ability correlates positively with this factor which suggests that empathy is one of the characteristics present in a good listener.

It is not surprising to find the achievement motivation score to be related to empathy, if empathy implies greater sensitivity to human problems. If this is so, one wonders if sensitivity to human problems is related to a need to do something about them and whether the present achievement motivation score has in its variance a greater component of sensitivity to social than to natural science problems. The first responses on both Similes II and Letter Star II, together with the ideas-retained score on Revision II, also had loadings in the  $.20$ 's on this factor.

An alternate explanation which might pertain to one aspect of empathy is that the factor measures communal awareness, a shared score of information and understanding, verbal in whole or in part. But the verbal element may be incidental in a factor including various other elements.

Factor L: Peer Ratings on Communication Abilities. The tests which have high loadings on this factor are as follows:

81	Socio. Quest.--listen	.51
78	Socio. Quest.--drill	.46

The two scales of sociometric ratings of listening ability and drill performance loaded high here. These were the only two sociometric scores retained in the factor study, because the average intercorrelations among the sociometric scores were generally much higher than the intercorrelations between these two (which were the pair retained because of their low intercorrelation). Perhaps this is a rating-by-peers factor on communication abilities. Some self-report scores such as writing ability and interest in speaking and reading also appear here with low positive loadings. The appearance of Naming Names as the only ability score with a significant loading ( $.26$ ) on this factor is difficult to explain.

Factor M: The tests which have high loadings on this factor are as follows:

32	Telegram Writing I--words	.79
31	Telegram Writing I--ideas	.62

Two scores on Telegram I, the number of words and the number of ideas, define this factor. Since these two scores come from the same telegram writing task, and are not experimentally independent, and since no other scores have loadings above .20, it seems unwise at this time to attempt to interpret this double factor, which was almost orthogonal to the other rotated factors.

Summary: Twelve of the 13 rotated factors were interpreted with 4 of these being previously established landmark factors. These 4 landmark factors are at the top of the list (above the dotted line) of the titles of Battery B factors below.

Factor A: Ideational Fluency  
 Factor B: Listening Comprehension  
 Factor C: Verbal Knowledge  
 Factor D: Verbal Originality

-----  
 Factor E: Verbal Superficiality  
 Factor F: Wordiness of Expression  
 Factor G: Self Estimate of Expressional Ability  
 Factor H: Self Estimate of Writing Ability  
 Factor I: Negative Self Report on Communication Traits  
 Factor J: Aspiration in Communication Abilities  
 Factor K: Empathy  
 Factor L: Peer Ratings of Communication Abilities

Additional general discussion of these factors appears in the fourth section (the last section) of Chapter V. All of the factors found in both Batteries A and B are also listed in Chapter VI, together with a discussion of any overlapping and further elaboration of these factors.



APPENDIX III

Table No.		Page No.
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Table 41

## Description of Predictor Scores in Batteries A, B, and C

Test Name and Description	Scores			Test Score Number in Each Battery
	A	B	C	
<u>Abstracting (15 min.)*</u> S is to read one chapter in an information booklet and write a single paragraph summary of it.				
			a. Total the important ideas from the chapter which are accurately reproduced in the summary.	63
			b. Total the words in the summary.	64
			c. Ratio score of words per idea.	65
<u>Adjective Check List</u> From a list of adjectives that might apply to people when they are writing, S is to check the ones which describe him or his writing.				
			a. Positive. Total the positive adjectives checked.	--
			b. Negative. Total the negative adjectives checked.	47
<u>All-Round Ability</u> S is to rate himself on four scales of communication ability as he compares himself with a group of peers.				
			Total the weights separately on the four scales to obtain the following scores:	
			a. Speaking	5
			b. Writing	6
			c. Reading	7
			d. Listening	8
<u>Associations (Two Way) (5 min.)</u> S is to write a word that is in some way associated in meaning with two given words.				
			The score is the total number of words written that have the required double association.	6
<u>A Test of Insight</u> S is to read descriptions of characteristic behaviors of different men, and to explain why each man behaves as he does.				
			a. Total the item weights for the Achievement Motivation score, i.e., the degree of need to achieve.	--
			b. Total the item weights for the need for Affiliation score.	58
			c. Total the item weights for the need-for-Status score.	--
				41
				--
				42

\*Time in minutes when a time limit was used. If a test had two subtests, the time limit for each is also given.

Test Name and Description

Scores

The score is the number of correct answers marked.

Test Name and Description	A	B	C
<u>Auditory Retention</u> (as recorded)	13	24	14
<u>Biographical Information Blank</u>	--	--	54
<u>Brick Uses</u> (5 min.)	--	52	38
<u>Completion</u> (8 min.)	47	53	37
<u>Compounding Words I</u> (5 min.--2 1/2 + 2 1/2)	34	--	--
	35	--	--

Auditory Retention (as recorded)  
S is to listen to two lectures which are presented on a recorder. The lectures contain factual data about two different subjects. Subsequent to the lecture presentation, S is to answer 18 questions presented by recorder about the lecture information.

Biographical Information Blank  
S is to give a self-report of his interest, attitudes, and experiences relative to communication activities on a 30-item biographical blank.

Brick Uses (5 min.)  
S is to list as many uses as possible for a brick.

Completion (8 min.)  
In each of several incomplete sentences, S is to think of the word with the appropriate number of letters that belongs in a blank space. From a list of first letters given, S is to select the one that is the first letter of the missing word.

Compounding Words I (5 min.--2 1/2 + 2 1/2)  
S is to write as many existing compound words as he can for each of the two stimulus words, man and sea.

Total the responses separately in each of the following four areas to obtain the following scores:

- a. Speaking
- b. Writing
- c. Reading
- d. Listening

Total the number of minimally acceptable uses.  
Total the category changes in the uses listed.

The score is the number of correct letters selected.

Total the acceptable compound words for the word, man.  
Total the acceptable compound words for the word, sea.



Test Name and DescriptionCompounding Words II (7 min.)

S is to write fresh new compound words for each object or action in a given list.

ScoresTest Score Number  
in Each Battery

A	B	C
54	65	48
55	66	--
56	67	--
57	68	--
58	69	49
15	25	--
14	26	--
--	19	29
--	20	30
--	21	31
--	22	32

- Total the minimally acceptable compound words.
- Total the weights given for the originality of the compound words
- Total the weights given for the evocativeness of the compound words
- Total the weights given for the accuracy of the compound words.
- Total the weights given for the quality of the sound pattern of each compound word, based on alliteration, assonance, rhyme, consonance, chiasmus, and rhythm.

Consequences Test (6 min.)

S is to list as many consequences as possible that might result if given changes were to occur in certain socially stabilized situations. There are two parts to this test.

- Score each part by totaling all the acceptable consequences.
- Score each response as high or low depending on degree of remoteness of each consequence. Total the "high" scores for the total remoteness score.

Difference Scores between All-Round Ability  
and Satisfactory Ability

This score does not require any additional test administration. The score is merely an arithmetic difference between corresponding ratings on the already administered Satisfactory Ability Scale and All-Round Ability Scale.

Total the differences between the scores in each of the following four areas to obtain the following difference scores:

- Speaking
- Writing
- Reading
- Listening



Test Name and Description

Scores

A B C

-- 63 46

The Empathy Test

S is to place himself in the position of the average (hypothetical) person and rank the likes and dislikes of average people on the items given.

Compute the amount by which each ranking deviated from actual survey-established ranking. Total these deviations for the score.

First & Last Letters (4 min.)

S is to write as many words as possible that begin with C and end with T.

Total the acceptable words that begin with C and end with T.

Interest Scales

S is to check the degree of interest which he would have if he were doing each activity listed (the weights range from one through five).

Total the weights in each area for the following scores:

- a. Speaking
- b. Writing
- c. Reading
- d. Listening

-- 27 --  
 -- 28 --  
 -- 29 --  
 -- 30 --

Letter Star I (5 min.)

S is to write a meaningful phrase for each given series of letters and stars. Each letter represents a word beginning with that letter, while each star represents another word in the phrase.

The score is the total number of acceptable meaningful phrases produced.

9 -- --

Letter Star II (5 min.)

S is to write a maximum of three phrases for each of a series of Letter Star formulas. Each letter represents a word beginning with that letter, while each star represents another word in the phrase.

- a. Total all the first responses across the items.
- b. Total all the 2nd and 3rd responses.

30 45 18  
 31 46 19



Test Name and DescriptionScoresTest Score Number  
in Each Battery

	A	B	C
Letter Star III (5 min.--2 +3)			
a. Number of correct phrases in the first formula phrases.	51	--	--
b. Number of correct words in the second formula phrases.	52	--	--
Naming Names (2 min.)			
S is to write as many names of boys or girls as possible in the time allowed.	1	9	--
Naming States (3 min.)			
S is to write as many names of states in the United States as possible in the time allowed.	2	10	--
Outlining I (10 min.)			
S is to read a selection of well-organized printed material and fill in the skeleton outline based on it.	62	74	--
Outlining II (10 min.)			
S is to read a selection of well-organized printed material and fill in the skeleton outline based on it.	--	--	53
PE Scale (Manifest Anxiety)			
S is to mark each statement either true or false, as applied to him.	--	70	50
	--	71	51

Letter Star III (5 min.--2 +3)

S is to write as many phrases as possible for each of two letter star formulas. Each letter represents a word beginning with that letter. While each star represents another word in the phrase.

- Number of correct phrases in the first formula phrases.
- Number of correct words in the second formula phrases.

Naming Names (2 min.)

S is to write as many names of boys or girls as possible in the time allowed.

The score is the total number of acceptable responses written.

Naming States (3 min.)

S is to write as many names of states in the United States as possible in the time allowed.

The score is the total number of acceptable responses written.

Outlining I (10 min.)

S is to read a selection of well-organized printed material and fill in the skeleton outline based on it.

Total the number of important ideas placed in the outline.

Outlining II (10 min.)

S is to read a selection of well-organized printed material and fill in the skeleton outline based on it.

Total the number of important ideas extracted from the written material and placed correctly in the outline.

PE Scale (Manifest Anxiety)

S is to mark each statement either true or false, as applied to him.

- Anxiety score. Total all items that reveal anxiety.
- Lie score. Total all items that reveal lies.

Test Name and Description	Scores			Test Score Number In Each Battery
	A	B	C	
<p><u>Phrase Check List</u></p> <p>S is to check each statement which generally applies to him or to his situation when he is giving a speech.</p>				
<p><u>Plot Titles</u> (6 min.--3 + 3)</p> <p>S is to write as many appropriate titles as possible for two given story plots.</p>				
<p><u>Qualities of a Superior Speaker</u></p> <p>In each item, S is to select the one attribute which he feels most nearly describes a typical superior speaker.</p>				
<p><u>Revision I</u> (5 min.)</p> <p>S is to make the given "wordy writing" brief and clear by simply striking out the unnecessary words.</p>				
<p><u>Revision II</u> (5 min.)</p> <p>S is to rewrite the given wordy sentences. Shorten them as much as possible by replacing groups of words with single words or shorter phrases, without destroying any of the meaning.</p>				
<p>a. Positive. Total the positive adjectives checked.</p> <p>b. Negative. Total the negative adjectives checked.</p>	--	54	39	
<p>a. Total the number of clever responses for the two plots.</p> <p>b. Total the number of non-clever responses for the two plots.</p>	33	--	9	
<p>Total the weights for each attribute selected for the score.</p>	--	64	47	
<p>a. Total the correct strike-outs.</p> <p>b. Total the incorrect strike-outs of words which should have been left in.</p>	38	--	--	
<p>a. Total number of ideas retained in the revision.</p> <p>b. Total number of words used in the revision.</p> <p>c. Ratio score of words used per idea in each revision.</p>	39	--	--	
	40	49	20	
	41	50	21	
	42	51	22	

Test Name and DescriptionSatisfactory Ability Scales

S is to check the minimum ability he would be satisfied to possess for the rest of his life, on each of the four scales.

Sentence Building (6 min.--3 + 3)

S is to rewrite each of two given sentences in as many ways as possible without losing any of the meaning, using at least 4 words from the original sentence.

Sentence Fluency (6 min. 3 + 3)

S is to express a given thought in as many ways as possible, using a separate sentence for each expression.

Sentence Gestalt (4 min.--2 + 2)

S is to divide into consecutively meaningful individual words, two paragraphs that have been so typed that there is no spacing between any words or letters.

Similes I (4 min.)

S is to complete several incomplete similes by adding suitable words or phrases.

Test Score Number in Each Battery

	A	B	C
Total the weights separately on the four scales to obtain the following scores:			
a. Speaking	--	15	1
b. Writing	--	16	2
c. Reading	--	17	3
d. Listening	--	18	4
Total the minimally acceptable sentences written.			
a. For the first sentence, on page one.	48	56	--
b. For the second sentence, on page two.	49	57	--
Total the acceptable sentences produced.			
a. Total the acceptable sentences produced.	36	--	--
b. The quality score is the total of the weights assigned to each expression for number of given ideas reproduced and for cleverness.	37	--	--
Score one point for each word correctly delineated. Add for total.			
a. Score one point for each word correctly delineated. Add for total.	3	--	--
b. Score one negative point for each omission of a correct delineation mark.	4	--	--
Score the total number of minimally acceptable similes produced.			
a. Score the total number of minimally acceptable similes produced.	7	--	7
b. Score the quality of each simile as either high or low. Obtain a total of all high responses.	--	--	24
c. Compute the percentage of high quality scores, i.e., high quality/total responses.	--	--	23

Total the weights separately on the four scales to obtain the following scores:

- Speaking
- Writing
- Reading
- Listening

Total the minimally acceptable sentences written.

- For the first sentence, on page one.
- For the second sentence, on page two.

Total the acceptable sentences produced.

- Total the acceptable sentences produced.
- The quality score is the total of the weights assigned to each expression for number of given ideas reproduced and for cleverness.

Score one point for each word correctly delineated. Add for total.

- Score one point for each word correctly delineated. Add for total.
- Score one negative point for each omission of a correct delineation mark.

Score the total number of minimally acceptable similes produced.

- Score the total number of minimally acceptable similes produced.
- Score the quality of each simile as either high or low. Obtain a total of all high responses.
- Compute the percentage of high quality scores, i.e., high quality/total responses.



Test Name and Description	Scores			Test Score Number in Each Battery
	A	B	C	
<p><u>Similes II</u> (6 min.)</p> <p>S is to write three completions for each incomplete simile in a list.</p>	27	43	--	--
<p><u>Similes III</u> (5 min.-- 2 1/2 + 2 1/2)</p> <p>S is to write as many similes as possible to complete each of the two given phrases.</p>	28	44	--	--
<p><u>Skimming Exercise</u> (15 min.)</p> <p>S is to use an information booklet and find answers to specific questions. On the answer page, he is to indicate each correct answer and the booklet page on which it appears.</p>	43	--	--	--
<p><u>Social Institutions</u> (10 min.)</p> <p>For each of the social institutions or customs listed, S is to suggest two improvements which would be of benefit and use to our society.</p>	44	--	--	--
<p><u>Sociometric Questionnaire</u></p> <p>In each of five skills or situations, S is to name the three members of his platoon whom he regards as the best performers, and the three whom he regards as the poorest.</p>	45	--	--	--
<p>a. Total the acceptable first responses written across the list of items.</p> <p>b. Total the acceptable second and third responses together.</p>	61	73	--	--
<p>a. Total the minimally acceptable similes produced for the first phrase.</p> <p>b. Total the minimally acceptable similes produced for the second phrase.</p> <p>c. For the first phrase only, total the quality weights given for descriptiveness, appropriateness, and imagination.</p>	60	72	--	--
<p>a. Total the correct items.</p> <p>b. Total the correct pages indicated.</p> <p>c. Combine the correct pages and items for total score.</p>	--	--	52	--
<p>a. Response count score - total all responses.</p> <p>b. Direct implications score - total credits given for "superficial changes."</p> <p>c. Indirect implications score - total credits given for "far-reaching," or insightful responses.</p>	--	60	--	--
<p>a. Drill</p> <p>b. Reading</p> <p>c. Writing</p> <p>d. Listening</p> <p>e. Instructing</p>	--	61	44	--
<p>Rank order the men in each of the five areas to obtain the following scores:</p>	--	62	45	--
	--	78	--	--
	--	79	--	--
	--	80	--	--
	--	81	--	--
	--	82	--	--

Test Name and DescriptionSpeech Attitude Scale

In each statement, S is to choose one answer from four which best describes his feelings, from experience or anticipation, in a speaking situation.

Speech Sound Discrimination (as recorded)

S is to mark which word of a given pair is the word spoken on a recording.

Suffixes (4 min.)

S is to write as many words as possible in the time allowed that have the ending - tion.

Telegram Writing I (4 min.)

S is to write a telegram about a given situation using as few words as possible to transmit the important ideas of the situation.

Telegram Writing II (4 min.)

S is to write a telegram about a given situation using only 10 words or less.

<u>Scores</u>		<u>Test Score Number in Each Battery</u>		
		A	B	C
Total the weights from all the statements for the score of general attitude toward speaking.		--	40	--
The score is the number of words heard and marked correctly.		12	23	13
The score is the total number of words written that are true words and have the required ending.		5	--	--
a. Score by adding the number of important ideas transmitted from the given situation.		16	31	--
b. Score by adding the number of words used.		17	32	--
c. Compute a ratio score of the number of words used per idea.		18	33	--
a. Score by adding the number of important ideas transmitted from the given situation.		19	34	--
b. Score by adding the number of words used.		20	35	--
c. Compute a ratio score of the number of words used per idea.		21	36	--

Test Score Number  
in Each Battery

Scores

Test Name and Description

	A	B	C
<u>Telegram Writing III</u> (4 min.)			
S is to write a telegram about a given situation by using as few words as possible to transmit the important ideas of the situation.	--	--	15
	--	--	16
	--	--	17
<u>Theme</u> (5 min.)			
S is to write all he can in a discussion of the given vague topic.	59	--	--
<u>Topics</u> (5 min.)			
S is to write as many sub-topics as possible for a given situation or subject.	10	13	11
	11	14	12
<u>Verbal Classification</u> (4 min.)			
S is to mark in which of two word-classes a given stimulus word belongs.	29	--	6
<u>Vocabulary</u> (6 min.)			
S is to select the one word from four choices that is the synonym for or is the most closely related to the stimulus word.	8	11	10

- a. Score by adding the number of important ideas transmitted from the given situation.
- b. Score by adding the number of words used.
- c. Compute a ratio score of the number of words used per idea.

Total the number of words written.

- a. Score by determining the number of relevant ideas contained in all of the topics written.
- b. Score by determining the number of different categories of relevant subjects contained in the topics written.

Total the acceptable responses.

The score is the total number of correct responses.



	<u>Test Name and Description</u>	<u>Scores</u>			<u>Test Score Number in Each Battery</u>
		A	B	C	
	<u>Word Association (6 min.)</u>				
	S is to write as many words as possible which can be associated to a series of stimulus words with 12 blank spaces for responses to each stimulus word.				
	<u>Word Knowledge (from ACB)</u>				
	This test is very nearly a basic vocabulary measure.				
	<u>Word Story (8 min.--4 + 4)</u>				
	S is to write a story that is interesting and meaningful and which uses as many of a given list of words as possible.				
	<u>Writing Attitude Scale</u>				
	S is to select the response in each question which best described him when he is writing.				
		a. Score for sheer quantity of words written which are of minimal quality.	22	37	33
		b. Total the quality weights assigned to each word for its popularity. The weights assigned were 0, 1, 2, and 3.	23	38	34
		c. This quality score is a total of all the 0, 1, and 2 weights.	24	39	--
		d. This score is the average quality.	--	--	35
		e. This score is a crude score of the valuation in quality of a subjects responses.	--	--	36
		This is an Air Force Classification Battery test, the scores of which were obtained from AFPTRC, Lackland AFB, San Antonio, Texas.	--	59	--
		a. Total the number of words used from the ones given.	25	41	--
		b. Rank the stories on the basis of originality, clarity, and interest by using the group comparison method of ranking.	26	42	--
		Total the weights (1, 2, 3, or 4) from each question.	--	12	--



Table 42  
Variable Numbers, Descriptions, Means, Standard Deviations, and Communalities for Battery A

Sequence Number	Name of Test	Type of Score	Mean	S.D.	h <sup>2</sup>
1	Naming Names	Total number of names written	22.91	5.39	56
2	Naming States	Total number of states written	23.69	7.32	64
3	*Sentence Gestalt (Associational Fluency)	Total words correctly delineated	41.41	14.07	53
4	Sentence Gestalt	Number of omissions	6.04	5.53	52
5	*Suffixes (Word Fluency)	Total number of acceptable words	10.12	5.10	52
6	*Two Way Associations (Associational Fluency)	Total number of acceptable words	5.54	3.43	58
7	*Similes I (Expressional Fluency)	Total number of minimally acceptable similes	12.48	4.32	63
8	*Vocabulary (Verbal Comprehension)	Total number of correct responses	17.25	6.76	76
9	*Letter Star I (Expressional Fluency)	Total number of phrases	18.21	5.10	50
10	*Topics (Ideational Fluency)	Number of relevant topics written	12.47	4.41	45
11	Topics	Number of category changes	5.06	1.87	
12	Speech Sound Discrimination	Number of words heard correctly	85.55	6.23	30
13	Auditory Retention	Number of correct answers	12.46	2.91	41
14	*Consequences (Originality)	Degree of remoteness	7.50	3.03	46
15	Consequences	Total acceptable consequences	6.17	3.62	69
16	Telegram Writing I	Number of ideas written	7.37	2.49	72
17	Telegram Writing I	Number of words used	14.67	4.54	50
18	Telegram Writing I	Ratio score, words per idea	63.13	10.39	41
19	Telegram Writing II	Number of ideas written	5.41	1.83	
20	Telegram Writing II	Number of words used	10.08	2.30	15
21	Telegram Writing II	Ratio score, words per idea	87.34	15.99	18
22	*Word Association (Associational Fluency)	Number of minimally acceptable words	17.24	7.41	73
23	Word Association	Degree of unpopularity of the words written	26.12	13.42	
24	Word Association	Degree of high level unpopularity of the words written	8.87	6.49	
25	Word Story	Number of words used	14.61	4.76	47
26	Word Story	Ranking of stories with regard to interest converted to scaled score	51.05	8.64	40
27	Similes II	Acceptable first responses	10.94	2.91	53
28	Similes II	Acceptable second and third responses	11.91	6.80	64

\*Landmark test with factor content in parentheses.

Sequence Number	Name of Test	Type of Score	Mean	S.D.	$h^2$
29	*Verbal Classification (Verbal Classification)	Acceptable responses	20.78	8.76	53
30	Letter Star II	Total first responses	6.81	2.11	43
31	Letter Star II	Total second and third responses	6.04	3.46	57
32	Plot Titles	Number of nonclever responses	11.11	5.25	51
33	*Plot Titles (Originality)	Number of clever responses	8.61	12.97	39
34	Compounding Words I	Total acceptable compound words for "man"	45.34	25.83	14
35	Compounding Words I	Total acceptable compound words for "sea"	42.15	28.44	22
36	Sentence Fluency	Total acceptable sentences produced	8.03	2.98	53
37	Sentence Fluency	Quality score for ideas reproduced and cleverness	15.75	7.06	
38	Revision I	Total correct strike-outs	24.89	8.96	55
39	Revision I	Total incorrect strike-outs	5.38	4.79	15
40	Revision II	Number of ideas retained in the revision	11.55	4.94	
41	Revision II	Total number of words used in the revision	31.67	11.36	33
42	Revision II	Ratio score of words used per idea in the revision	69.77	11.33	27
43	Similes III	Total minimally acceptable similes for the first phrase	7.11	3.54	62
44	Similes III	Total minimally acceptable similes for second phrase	5.61	3.49	53
45	Similes III	Total quality weights for first phrase	13.00	6.66	
46	*Brick Uses (Ideational Fluency)	Total minimally acceptable uses	14.85	5.87	72
47	*Brick Uses (Spontaneous Flexibility)	Total category changes in uses listed	4.09	3.20	42
48	Sentence Building	Total minimally acceptable sentences written	6.35	2.73	59
49	Sentence Building	Total minimally acceptable sentences written	6.11	3.13	38
50	*First and Last Letters (Word Fluency)	Total acceptable words	9.42	3.39	43
51	Letter Star III	Number of correct words in first phrase	17.78	5.54	56
52	Letter Star III	Number of correct words in second phrase	15.37	7.84	58
53	*Completion (Verbal Comprehension)	Number of correct letters written	6.22	3.29	65
54	Compounding Words II	Total minimally acceptable compound words	7.67	7.59	56
55	Compounding Words II	Originality of compound words	8.46	9.57	
56	Compounding Words II	Evocativeness of compound words	8.08	8.82	
57	Compounding Words II	Accuracy of compound words	9.70	9.97	
58	Compounding Words II	Quality of sound pattern	2.84	3.53	
59	*Theme (Ideational Fluency)	Total number of words written	39.07	16.29	61

\*Reference test

<u>Sequence Number</u>	<u>Name of Test</u>	<u>Type of Score</u>	<u>Mean</u>	<u>S.D.</u>	<u>n<sup>2</sup></u>
60	Skimming Exercise	Total correct pages indicated	3.65	2.08	
61	Skimming Exercise	Total correct items indicated	2.60	1.96	53
62	Outlining I	Total number of important id -s	6.90	3.22	43
63	Abstracting	Important ideas reproduced in summary	2.99	2.75	
64	Abstracting	Total words in summary	40.79	28.43	37
65	Abstracting	Ratio score of words per idea	57.86	37.87	





Table 44  
Variable Numbers, Descriptions, Means, and Standard Deviations for Battery B

<u>Sequence Number</u>	<u>Name of Test</u>	<u>Type of Score</u>	<u>Mean</u>	<u>S.D.</u>	<u>h<sup>2</sup></u>
1	Biographical Information Blank	Speaking--Total weighted responses	13.88	4.05	55
2	Biographical Information Blank	Writing--Total weighted responses	13.44	3.66	46
3	Biographical Information Blank	Reading--Total weighted responses	15.88	3.59	
4	Biographical Information blank	Listening--Total weighted responses	21.54	3.79	
5	All-Round Ability	Speaking--Self Rating	4.28	1.39	77
6	All-Round Ability	Writing--Self Rating	4.31	1.20	77
7	All-Round Ability	Reading--Self Rating	5.07	1.18	
8	All-Round Ability	Listening--Self Rating	5.08	1.15	
9	Naming Names	Total number of names written	23.57	5.55	44
10	Naming States	Total number of states written	27.91	7.84	58
11	*Vocabulary (Verbal Comprehension)	Total number of correct responses	20.46	6.96	81
12	Writing Attitude Scale	Total weights	54.18	7.06	67
13	*Topics (Ideational Fluency)	Number of relevant topics written	11.69	4.44	54
14	Topics	Number of category changes	5.16	2.26	
15	Satisfactory Ability Scale	Speaking--Total weights	5.59	1.10	

\*Landmark test with factor content in parentheses.

Sequence Number	Name of Test	Type of Score	Mean S. D.	$h^2$
16	Satisfactory Ability Scale	Writing--Total weights	5.81 1.03	68
17	Satisfactory Ability Scale	Reading--Total weights	5.83 1.03	
18	Satisfactory Ability Scale	Listening--Total weights	5.90 1.08	
19	Difference Scores Between Satisfactory Ability and All-Round Ability	Speaking--Total difference between scores	4.29 1.35	68
20	Difference Scores Between Satisfactory Ability and All-Round Ability	Writing--Total difference between scores	4.48 1.25	83
21	Difference Scores Between Satisfactory Ability and All-Round Ability	Reading--Total difference between scores	3.78 1.19	57
22	Difference Scores Between Satisfactory Ability and All-Round Ability	Listening--Total difference between scores	3.81 1.19	50
23	Speech Sound Discrimination	Number of words heard correctly	87.29 5.23	23
24	Auditory Retention	Number of correct answers	13.68 2.53	38
25	*Consequences (Ideational Fluency)	Total acceptable consequences	7.06 3.25	32
26	*Consequences (Originality)	Degree of remoteness	6.61 4.10	50
27	Interest Scales	Speaking--Total weights	19.04 3.72	64
28	Interest Scales	Writing--Total weights	16.87 3.73	
29	Interest Scales	Reading--Total weights	25.39 4.03	40
30	Interest Scales	Listening--Total weights	23.36 3.71	
31	Telegram Writing I	Number of ideas written	7.79 2.31	71
32	Telegram Writing I	Number of words used	14.52 4.35	67

<u>Sequence Number</u>	<u>Name of Test</u>	<u>Type of Score</u>	<u>Mean</u>	<u>S.D.</u>	<u>h<sup>2</sup></u>
33	Telegram Writing I	Ratio score of words used per idea	19.76	8.06	55
34	Telegram Writing II	Number of ideas written	5.46	1.80	
35	Telegram Writing II	Number of words used	10.09	2.14	19
36	Telegram Writing II	Ratio score of words used per idea	19.51	8.24	23
37	*Word Association (Associational Fluency)	Number of minimally acceptable words	17.85	6.93	56
38	Word Association	Degree of unpopularity of the words written	27.88	15.83	
39	Word Association	Degree of high level unpopularity of the words written	10.15	7.39	
40	Speech Attitude Scale	Total weights	55.95	9.69	69
41	Word Story	Number of given words used	12.26	4.77	62
42	Word Story	Rank of stories for originality, clarity, and interest converted to scaled score	51.00	8.66	45
43	Similes II	Acceptable first responses	11.12	2.79	41
44	Similes II	Acceptable second and third responses	12.63	6.58	55
45	Letter Star II	Acceptable first responses	6.31	2.00	31
46	Letter Star II	Acceptable second and third responses	6.54	3.45	44
47	Adjective Check List	Positive--Total positive adjectives checked	18.67	7.94	47
48	Adjective Check List	Negative--Total negative adjectives checked	4.60	3.38	28
49	Revision II	Number of ideas retained in the revision	14.09	4.03	44

<u>Sequence Number</u>	<u>Name of Test</u>	<u>Type of Score</u>	<u>Mean</u>	<u>S.D.</u>	<u>h<sup>2</sup></u>
50	Revision II	Number of words used in the revision	36.50	10.54	
51	Revision II	Ratio score of words used per idea	26.62	6.35	41
52	*Brick Uses (Ideational Fluency)	Total minimally acceptable uses	15.39	5.89	61
53	*Brick Uses (Spontaneous Flexibility)	Total category changes in the uses listed	4.71	3.44	40
54	Phrase Check List	Positive--Total positive phrases checked	5.37	3.58	67
55	Phrase Check List	Negative--Total negative phrases checked	7.02	5.32	59
56	Sentence Building	Total minimally acceptable sentences written	4.39	2.64	33
57	Sentence building	Total minimally acceptable sentences written	5.72	3.00	34
58	A Test of Insight	Total weights for Achievement Motivation	9.40	3.52	31
59	*Word Knowledge (Verbal Comprehension)	ACB scores obtained from AFFTRC, Lackland AFB, San Antonio, Texas	5.94	1.80	82
60	Social Institutions	Total all responses	13.81	5.82	
61	*Social Institutions (Sensitivity to Problems)	Total credits given for "Superficial changes"	10.25	5.07	47
62	Social Institutions	Total credits given for "far-reaching" or insightful responses	3.56	2.82	36
63	The Empathy Test	Total deviations from survey-established ranking	32.38	10.98	30
64	Qualities of a Superior Speaker	Total for attributes selected	31.71	6.05	27
65	Compounding Words II	Total minimally acceptable compound words	3.00	6.94	41
66	Compounding Words II	Originality of compound words	11.13	10.74	

<u>Sequence Number</u>	<u>Name of Test</u>	<u>Type of Score</u>	<u>Mean</u>	<u>S.D.</u>	<u>h<sup>2</sup></u>
67	Compounding Words I	Evocativeness of compound words	14.53	12.88	
68	Compounding Words II	Accuracy of compound words	12.20	12.01	
69	Compounding Words II	Quality of sound patterns	3.45	3.84	
70	PE Scale	Total of all items revealing anxiety	15.34	7.69	41
71	PE Scale	Total of all items revealing lies	3.38	2.06	42
72	Skimming Exercise	Total number of correct pages	4.09	2.28	
73	Skimming Exercise	Total number of correct items	3.08	2.16	43
74	Outlining I	Total number of important ideas in outline	7.40	3.60	41
75	Abstracting	Total words in the summary	50.52	20.18	50
76	Abstracting	Important ideas reproduced in summary	3.55	2.65	37
77	Abstracting	Ratio score of words per idea	15.57	15.03	
78	Sociometric Questionnaire	Sociometric ranking on oral drill performance	26.16	7.92	32
79	Sociometric Questionnaire	Sociometric ranking on reading ability	26.20	7.36	
80	Sociometric Questionnaire	Sociometric ranking on writing ability	26.21	6.40	
81	Sociometric Questionnaire	Sociometric ranking on listening ability	26.52	6.12	48
82	Sociometric questionnaire	Sociometric ranking on instructing ability	26.13	6.60	







Table 46  
Description of Criterion Scores in Battery C

<u>Situational Test Name and Description</u>	<u>Situational Test Scored</u>	<u>Score Number</u>
<p><u>Situation I. Conference</u></p> <p>Four S's are to act as "staff officers" at an AF base. They are to set up one full day's activities for an inspection and review by a visiting Lt. General.</p>	Score of communication ability in speaking. Each four men were judged on 18 items on an intercomparison ranking of 1, 2, 3, or 4 on each item	58
<p><u>Situation II. Oral Reading of Complex Instructions</u></p> <p>S is to read aloud, without any practice, some new aircraft servicing procedures to a group of "AF mechanics."</p>	Total score of oral reading ability. Each man rated 1, 2, or 3 on each of 14 items	59
<p><u>Situation III. Classroom Lecture</u></p> <p>S is to select pertinent information from all three given different kinds of "underground" material, and organize it on a 4 x 6 card. Using this card, he is to brief a group of "Airmen" on the physical and cultural characteristics of an Italian coastal town as preparation for invasion.</p>	<p>a. Card score-total important ideas written on the 4 x 6 card. 60</p> <p>b. Score of total number of important ideas delivered orally (tape recorded). 61</p> <p>c. Total score of speaking ability obtained by rating each man 1, 2, or 3 on each of 19 items. 62</p> <p>d. Score of amount of distortion of original material (from tape recording). 63</p> <p>e. Total number of errors presented orally. 79</p>	
<p><u>Situation IV. Instruction On-the-Job Training</u></p> <p>S is first given instruction in field-stripping a rifle. Then he instructs two other persons who are carefully rehearsed in the parts they are to play.</p>	Subjects were rated 0, 1, 2, or 3 on 35 items of communication ability, with ratings totaled.	64

<u>Situational Test Name and Description</u>	<u>Situational Test Scored</u>	<u>Score Number</u>
<p><u>Situation V. Problem Solving--Emergent Leadership</u></p> <p>S's work in groups of four. The task is to find a small roll of microfilm supposedly hidden in a room containing a great many possible hiding places.</p>	Each S is tallied as displaying or not displaying each of 25 items of communication ability. Tallies are totaled for score.	65
<p><u>Situation VI. Designated Leadership</u></p> <p>S is to direct two men in packing two pallet boards with various boxes so that they are neat and suitable for air shipment.</p>	<p>a. Total the number of times the subject performs any of the 5 scored items.</p> <p>b. Status score-total of remarks made by subject that attempt to increase his own status without directly helping the job.</p>	67
<p><u>Situation VII. Emergency Telephone Action</u></p> <p>S is acting Duty Officer at an AF base and is responsible for coordinating all emergency action by telephone. It is 2:00 A.M. and an air crash is reported in the nearby mountains.</p>	Subject is rated 1, 2, or 3 on each of 14 items of communication ability, with ratings totaled for the score.	68
<p><u>Situation VIII. Planning an Informative Paper for a Specific Audience</u></p> <p>S must sort several prepared random-order cards of lecture material into his best sequence.</p>	Subjects card sequence is checked against the best sequence. Score is based on amount of deviation of each card from its ideal sequential position.	69
<p><u>Situation IX. Written Exposition for a Specific Audience</u></p> <p>Using the same cards from Situation VIII, S is to write a brief informative exposition presenting the topic to a group of basic AF trainees.</p>	The exposition written by each subject is graded by two professional English instructors. A letter grade of A, B, C, D, or E is assigned to each paper depending on its worth as an accurate exposition.	70



<u>Situational Test Name and Description</u>	<u>Situational Test Score</u>	<u>Score Number</u>
<p><u>Situation X. Control Tower Listening Test</u> S is to write all that he can understand from each of eight recorded samples of actual control tower talk.</p>	<p>Score is total number of words subject written correctly.</p>	71
<p><u>Situation XI. Identification of Sounds</u> S is to write as many of 12 recorded common sounds as he can identify.</p>	<p>Score is total number of correct sound identifications.</p>	72
<p><u>Situation XII. Interview Situation Listening Test</u> S is to hear 3 minutes of live conversation between an "employer" and a "job applicant." S then answers orally-presented questions on the interview material.</p>	<p>Score is total number of correct answers.</p>	73
<p><u>Situation XIII. Reading Comprehension</u> S is to read three sets of material and answer questions within given time limits.</p>	<p>Score is total number of correct responses.</p>	74
<p><u>Situation XIV. Writing I</u> S is to write about some simple event involving people, organizing his material around a central impression.</p>	<p>The composition is rated 0, 1, 2, or 3 on each of five areas of writing ability, and the ratings are totaled.</p>	75
<p><u>Situation XV. Editing</u> S is to re-write a standard passage of poorly written material to make it concise and clear.</p>	<p>The re-written papers were ranked according to the criteria of (1) conciseness, (2) clarity, (3) completeness, and (4) good form. The group-comparison ranking technique was used to accomplish this scoring.</p>	76



<u>Situational Test Name and Description</u>	<u>Situational Test Scored</u>	<u>Score Number</u>
<p><u>Situation XVI. Administration of Disciplinary Action</u></p> <p>S, as a Commanding Officer, is to administer appropriate disciplinary action to an AF trainee (actor).</p>	Subject's performance is rated 1, 2, or 3 on each of 17 items on general communication ability.	77
<p><u>Situation XVII. Written Interpretation of a Higher Directive</u></p> <p>S, as "Maintenance Officer," is to re-write a directive from the CO regarding excessive use of the telephone. He is to write it so that the average airman will understand the problem and what is expected of him.</p>	<p>The following scores were derived from the papers:</p> <p>a. Interest ranking. 82</p> <p>b. Addition and distortion. 83</p> <p>c. Idea content. 84</p>	82 83 84
<p><u>Situation XVIII. Writing II</u></p> <p>S is to take one paragraph from descriptive material provided and re-write it, filling it with detail which will make the picture vivid and interesting.</p>	The composition is rated 0, 1, 2, or 3 on each of five areas of ability. These ratings are added for the total score.	78
<p><u>Writing Organization</u></p> <p>This score does not depend upon a separate test administration. Some subscores felt to involve organization of written material were combined additively across three situational tests. The subscores were equalized with regard to mean and standard deviation before they were combined.</p>	This score was obtained by adding subscores measuring literary organization, obtained from the Writing I and Writing II situational tests.	80
<p><u>Speaking Organization</u></p> <p>This score does not depend upon a separate test administration. Some subscores felt to involve organization of spoken material were combined additively across three situational tests. The subscores were equalized with regard to mean and standard deviation before they were combined.</p>	Subscores measuring Speaking Organization from the Conference, Classroom, Lecture, and Emergency Telephone Action situations were added to obtain the total score called Speaking Organization.	81

Table 47  
Test and Criterion Scores in Battery C

<u>Number</u>	<u>Name of Test</u>	<u>Type of Score</u>	<u>Previous Battery</u>	<u>Mean</u>	<u>S.D.</u>	<u>h<sup>2</sup></u>
1	Satisfactory Ability Scale	Speaking--Total weights	B	5.94	.99	85
2	Satisfactory Ability Scale	Writing--Total weights	B	5.89	.99	80
3	Satisfactory Ability Scale	Reading--Total weights	B	6.06	.97	77
4	Satisfactory Ability Scale	Listening--Total weights	B	6.07	.83	82
5	First and Last Letters	Total acceptance words	A	10.31	3.54	81
6	Verbal Classification	Acceptable responses	A	13.12	4.53	78
7	Similes I	Total number of minimally acceptable similes	A	14.54	4.14	74
8	Plot Titles	Number of non-clever responses	A	10.11	4.77	75
9	Plot Titles	Number of clever responses	A	1.97	1.66	76
10	Vocabulary	Total number of correct responses	AB	27.59	8.20	83
11	Topics	Number of separate topics	AB	16.23	4.51	75
12	Topics	Number of changes in topics	AB	6.56	1.94	75
15	Speech Sound Discrimination	Number of words marked correctly	AB	94.51	2.35	86
14	Auditory Retention	Number of correct answers marked	AB	16.42	1.37	75

Number	Name of Test	Type of Score	Previous Battery		
			Mean	S.D.	h <sup>2</sup>
15	Telegram Writing III	Number of ideas written	AB 3.33	2.25	78
16	Telegram Writing III	Number of words used	AB 14.52	3.40	76
17	Telegram Writing III	Ratio score of words per idea	AB 19.13	10.55	69
18	Letter Star II	Total first responses	AB 6.44	2.27	71
19	Letter Star II	Total second and third responses	AB 8.28	4.32	82
20	Revision II	Total number of ideas retained in the revision	AB 13.23	4.04	67
21	Revision II	Total number of words used in the revision	AB 33.33	7.79	68
22	Revision II	Ratio score of words per idea	AB 21.56	4.11	72
23	Similes I	The percentage of high quality responses	35.19	21.29	83
24	Similes I	Total of all high quality responses	5.04	3.06	75
25	All-Round Ability	Speaking--Self rating	B 4.39	1.10	79
26	All-Round Ability	Writing--Self rating	B 4.41	1.31	79
27	All-Round Ability	Reading--Self rating	B 5.12	1.15	87
28	All-Round Ability	Listening--Self rating	B 5.18	1.00	83
29	Difference Scores between Satisfactory Ability and All-Round Ability	Speaking--Total difference between scores	B 4.33	1.11	84
30	Difference Scores between Satisfactory Ability and All-Round Ability	Writing--Total difference between scores	B 6.48	1.22	86

<u>Number</u>	<u>Name of Test</u>	<u>Type of Score</u>	<u>Previous Battery</u>	<u>Mean</u>	<u>S.D.</u>	<u>h<sup>2</sup></u>
31	Difference Scores between Satisfactory Ability and All-Round Ability	Reading--Total difference between scores	B	5.94	1.03	80
32	Difference Scores between Satisfactory Ability and All-Round Ability	Listening--Total difference between scores	B	5.76	1.31	91
33	Word Association	Number of minimally acceptable words	AB	27.47	7.69	77
34	Word Association	Degree of unpopularity of the words written	AB	47.92	16.60	77
35	Word Association	Average quality of words		17.19	2.42	85
36	Word Association	Variation in quality score		72.34	9.07	91
37	Brick Uses	Total category changes in the uses listed	AB	5.92	3.99	90
38	Brick Uses	Total number of minimally acceptable uses	AB	17.89	6.16	76
39	Phrase Check List	Positive--Total positive phrases checked	E	5.61	3.46	85
40	Phrase Check List	Negative--Total negative phrases checked	E	6.79	4.65	84
41	A Test of Insight	Need for affiliation score		3.50	2.04	84
42	A Test of Insight	Need for status score		2.66	1.95	90
43	A Test of Insight	Achievement motivation score	B	6.69	2.54	82
44	Social Institutions	Direct--Total credits given for "superficial changes"	B	5.29	2.52	86
45	Social Institutions	Indirect--Total credits given for "far-reaching," or B insightful responses	or B	3.43	1.99	90
46	The Empathy Test	Total deviations from survey established ranking	B	71.69	16.14	85
47	Qualities of a Superior Speaker	Total for attributes selected	B	30.47	4.58	80
48	Compounding Words II	Total minimally acceptable compound words	AB	10.84	5.87	78

<u>Number</u>	<u>Name of Test</u>	<u>Type of Score</u>	<u>Previous Battery</u>	<u>Mean</u>	<u>S.D.</u>	<u><math>\frac{2}{h}</math></u>
49	Compounding Words II	Total for quality of sound pattern of comp. words	AB	6.06	5.02	71
50	PE Scale	Total of all itmes revealing anxiety	B	13.59	7.17	84
51	PE Scale	Total of all items revealing lies	B	2.92	1.78	81
52	Skimming Exercise	Total of correct pages plus correct items	AB	10.89	4.46	81
53	Outlining III	Total important ideas placed in outline	AB*	10.66	5.17	69
54	Biographical Information Blank	Speaking--Total weighted responses	B	18.67	3.79	80
55	Biographical Information Blank	Writing--Total weighted responses	B	12.25	3.10	81
56	Biographical Information Blank	Reading--Total weighted responses	B	14.87	3.34	84
57	Biographical Information Blank	Listening--Total weighted responses	B	20.13	3.69	82
58	Situation I	Conference--Score of communication ability in speaking		45.39	13.10	81
59	Situation II	Oral reading of complex instructions--Score of oral reading ability		25.32	5.73	80
60	Situation III	Classroom lecture--Total number of important ideas written on card		17.89	6.56	76
61	Situation III	Classroom lecture--Total number of important ideas delivered orally		16.03	6.09	77
62	Situation III	Classroom lecture--Total score of speaking ability		33.57	6.60	79
63	Situation III	Classroom lecture--Score of amount of distortion of original material		3.34	1.94	85
64	Situation IV	Instruction On-the-job training--Total communication ability		51.62	13.74	81
65	Situation V	Problem solving--Emergent leadership--Tally of communication ability		6.63	3.45	80



<u>Number</u>	<u>Name of Test</u>	<u>Type of Score</u>	<u>Previous Battery</u>	<u>Mean</u>	<u>S.D.</u>	<u>h<sup>2</sup></u>
66	Situation VI	Designated leadership--Total number of times subject communicates	30.58	14.30	79	
67	Situation VI	Designated leadership--Total number of remarks made by subject for status	1.07	1.51	76	
68	Situation VII	Emergency telephone action--Total of ratings on communication ability	27.48	5.62	71	
69	Situation VIII	Planning informative paper--Amount of deviation of each card from its ideal position	6.07	2.24	77	
70	Situation IX	Written exposition for a specific audience--brief informative exposition	3.58	1.85	75	
71	Situation X	Control tower listening test--Total number of correct words written	33.19	7.30	80	
72	Situation XI	Identification of sounds--Total of correct sound identifications	9.48	1.34	89	
73	Situation XII	Interview situation listening test--Total number of correct answers	9.94	1.33	87	
74	Situation XIII	Reading comprehension--Total correct responses	17.86	4.40	90	
75	Situation XIV	Writing I--Total ratings of composition	8.94	2.53	82	
76	Situation XV	Editing--Quality of re-written standard passage	49.94	9.90	89	
77	Situation XVI	Administration of disciplinary action--Total ratings on general communication ability	68.01	11.91	90	
78	Situation XVIII	Writing II--Total ratings on composition	9.37	2.91	91	
79	Situation III	Classroom lecture--Total number of errors	7.27	1.83	89	

<u>Number</u>	<u>Name of Test</u>	<u>Type of Score</u>	<u>Mean</u>	<u>S.D.</u>	<u>h<sup>2</sup></u>
80	Writing Organization	Score of literary organization on Writing I and Writing II tasks	4.03	1.17	90
81	Speaking Organization	Total of selected sub-scores from conference, lecture, and emergency action situations	49.97	6.47	85
82	Situation XVII	Written interpretation--Interest rank	49.71	9.72	88
83	Situation XVII	Written interpretation--Addition and distortion	.59	.93	85
84	Situation XVII	Written interpretation--Idea	3.37	1.82	86
85	Rate of Oral Reading	Timed Scores from Tape Recordings			84
86	Rate of Public Speaking	Timed Scores from Tape Recordings			81
87	Number of Seconds in Pauses per Minute of Speaking	Timed Scores from Tape Recordings			72



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100



Table 49

Correlations of Three Rate of Talking Scores with all Other  
Battery C Scores\*

Score	#85 Rate of Oral Reading	#86 Rate of Public Speaking	#87 Seconds pauses/ minute speaking	Score	#85 Rate of Oral Reading	#86 Rate of Oral Speaking	#87 Seconds pauses/ minute speaking
1.	40	21	-16	45.	33	27	-12
2.	36	18	-16	46.	08	10	-21
3.	42	23	-17	47.	39	09	-11
4.	26	16	-19	48.	34	29	-23
5.	35	24	-18	49.	35	05	07
6.	35	23	-29	50.	10	01	-06
7.	36	11	-10	51.	-01	07	-13
8.	16	03	-01	52.	32	14	-21
9.	23	18	-13	53.	27	30	-41
10.	71	29	-23	54.	01	09	-06
11.	42	34	-20	55.	21	25	-19
12.	22	10	-12	56.	20	18	-26
13.	27	25	-15	57.	-04	07	00
14.	20	07	-08	58.	06	45	-23
15.	12	-01	00	59.	57	38	-34
16.	-20	-04	-08	60.	22	27	-33
17.	-13	13	-15	61.	40	31	-45
18.	11	-07	-04	62.	36	43	-45
19.	18	-04	06	63.	04	-07	05
20.	45	32	-27	64.	24	14	-02
21.	22	16	-15	65.	03	11	07
22.	-45	-35	30	66.	14	21	04
23.	21	14	-14	67.	07	-03	-09
24.	28	10	-12	68.	38	34	-22
25.	19	10	-12	69.	41	08	-04
26.	34	26	-21	70.	35	09	-04
27.	50	26	-19	71.	01	-07	08
28.	09	13	05	72.	-20	-17	05
29.	16	09	-01	73.	18	08	-23
30.	-08	-14	10	74.	49	35	-36
31.	-15	-07	04	75.	55	29	-29
32.	16	07	-19	76.	25	32	-20
33.	40	30	-27	77.	15	33	-07
34.	41	31	-25	78.	44	38	-36
35.	42	16	-14	79.	-17	-08	11
36.	17	-13	-02	80.	40	38	-26
37.	15	28	-19	81.	36	46	-33
38.	25	26	03	82.	00	30	-11
39.	22	-08	07	83.	23	-02	-02
40.	-35	-16	21	84.	23	19	-15
41.	16	18	-20	85.	--	42	-43
42.	00	11	-10	86.	42	--	-65
43.	22	00	05	87.	-43	-65	--
44.	21	04	-22				

\*Decimals have been omitted.



Table 50

## Predictor Tests and Relevant Statistics for Each Multiple Correlation

Crit. No.		Criterion Situational Score	No. Sig. Pred.	Pred. No.*	Predictor Score	Val.	Mult. R
c 58	I	Confrence	5	53	Outlining III	.52	.60
				45	Soc. Instit.--indirect	.34	
				34	Word Assoc.--unpop.	.15	
				48	Comp. Words II--total	.25	
c 59	II	Oral Reading	33	34	Word Assoc.--unpop.	.52	.71
				1	Satis. Ability--speak	.49	
				56	Biog. Info.--read	.40	
				48	Comp. Words II--total	.41	
s 60	III	Lecture--ideas/notes	16	26	All-Round Ability--write	.35	
				5	First and Last Letters	.28	.47**
				53	Outlining III	.28	
				40	Phrase Check List--neg.	-.27	
c 61	III	Lecturs--ideas/oral	17	10	Vocabulary	.49	.58
				53	Outlining III	.41	
				40	Phrase Check List--neg.	-.37	
				20	Revision II--ideas	.37	
c 62	III	Lecture--speaking	26	40	Phrase Check List--neg.	-.53	.65
				22	Revision II--words/idea	-.44	
				45	Soc. Instit.--indirect	.41	
				30	Diff. Score--write	-.31	
c 63	III	Lecture--distortion	1	33	Brick Uses--total	.35	.35
c 64	IV	Instruc. On-the-Job	7	1	Satis. Ability--speak	.30	.41
				30	Diff. Score--write	.23	
				47	Qual. of Super. Spkr.	.22	
				3	Satis. Ability--read	.24	
s 65	V	Emergent Leadership	0				
s 66	VI	Desig. Leader.--total	6	45	Soc. Instit.--indirect	.33	
				19	Letter Star II-2 & 3 resp.	.26	.45**
				54	Biog. Info.--speak	.27	
				42	Test of Insight--status	.22	
s 67	VI	Desig. Leader.--status	2	25	All-Round Ability--speak	.30	
				22	Revision II--words/idea	.24	.32**
c 68	VII	Emergency Telephone	16	10	Vocabulary	.39	.54
				37	Erick Uses--categ. chgs.	.37	
				53	Outlining III	.37	
				34	Word Assoc.--unpop.	.33	

Crit. No.	Criterion Situational Score	No. Sig. Pred. No.*	Predictor Score	Mult.	
				Val.	R
s 69	VIII Plan. Inform. Paper	24	10 Vocabulary	.52	.62**
			14 Auditory Retention	.30	
			2 Satis. Ability--write	.01	
			33 Word Assoc.--total	.31	
s 70	IX Written Exposition	17	10 Vocabulary	.50	.55**
			52 Skimming	.35	
			39 Phrase Check List--pos.	.27	
			26 All-Round Ability--write	.33	
c 71	X Control Tower Listening	14	2 Satis. Ability--write	.41	.60
			18 Letter Star II--1st resp.	.38	
			27 All-Round Ability--read	.26	
			54 Biog. Info.--speak	-.22	
c 72	XI Identification of Sounds	3	29 Diff. Score--speak	-.29	.41
			14 Auditory Retention	.25	
			15 Telegram III--ideas	-.23	
c 73	XII Interview Listening	16	52 Skimming	.32	.49
			11 Topics--quantity	.32	
			45 Soc. Instit.--indirect	.29	
			37 Brick Uses--categ. chgs.	.28	
s 74	Reading Comprehension	24	10 Vocabulary	.63	.69**
			14 Auditory Retention	.31	
			22 Revision II--words/idea	-.41	
			27 All-Round Ability--read	.53	
s 75	XIV Writing I	30	10 Vocabulary	.71	.77**
			19 Letter Star II--2 & 3 resp.	.29	
			1 Satis. Ability--speak	.52	
			20 Revision II--ideas	.54	
s 76	XV Editing	18	20 Revision II--ideas	.49	.58**
			18 Letter Star II--1st resp.	.25	
			20 All-Round Ability--write	.33	
			16 Telegram III--words	-.28	
c 77	XVI Adm. Discip. Action	10	45 Soc. Instit.--indirect	.37	.49
			26 All-Round Ability--write	.35	
			54 Word Assoc.--unpop.	.29	
			37 Brick Uses--categ. chgs.	.23	
s 78	XVIII Writing II	28	26 All-Round Ability--write	.56	.70**
			5 First and Last Letters	.42	
			4 Satis. Ability--listen	.47	
			45 Soc. Instit.--indirect	.35	

<u>Crit. No.</u>		<u>Criterion Situational Score</u>	<u>No. Sig. Pred.</u>	<u>Pred. No.*</u>	<u>Predictor Score</u>	<u>Val.</u>	<u>Mult. R</u>
c 79	III	Lecture--errors	3	6	Verbal Classification	-.27	.40
				50	PE Scale--anxiety	-.22	
				13	Spch. Snd. Discrim.	-.22	
s 80		Writing Organization	25	3	Satis. Ability--listen	.53	
				45	Soc. Instit.--indirect	.39	
				34	Word Assoc.--unpop.	.45	.69**
				20	Revision II--ideas	.49	
c 81		Speaking Organization	25	53	Outlining III	.53	.65
				45	Soc. Instit.--indirect	.32	
				3	Satis. Ability--read	.38	
				37	Brick Uses--categ. chgs.	.31	
s 82	XVII	Written Interp.	2	5	First and Last Letters	.29	
				45	Soc. Instit.--indirect	.27	.37**
s 83	XVII	Written Interp.--discort	7	49	Comp. Words II--sound	.35	
				5	First and Last Letters	.27	
				7	Similes I--total	.28	.44**
				34	Word Assoc.--unpop.	.22	
s 84	XVII	Written Interp.--idea	11	9	Plot Titles--clever	.39	
				53	Outlining III	.30	
				31	Diff. Score--read	.22	.58**
				45	Soc. Instit.--indirect	.35	

Note: A complete description of the situational criteria and the selected predictor tests can be found in Tables 46 and 47 in Appendix V.

\*Listed in sequence selected.

\*\*Significant at the 1% level. In the case of four variables and an N of 80 the multiple correlation must be .36 or higher in order to be significant at the 1% level (Garrett, 1951, pp. 426-429).

## APPENDIX IV

### FACTOR ANALYSIS OF BATTERY C CRITERION SCORES: DETAILED RESULTS

As indicated in the second section of Chapter XI, a factor analysis of only the 27 criterion scores in Battery C was completed in order to obtain another important view of the criterion domain in the communications area. The 27 criterion scores in Battery C were factor analyzed by machine methods using the principal component method to obtain ten factors having an eigen value greater than 1.00. These factors were then rotated orthogonally to simple structure.

For convenience, the factor loadings of each of the ten factors that were extracted were listed in decreasing order of magnitude. Only those with an absolute value of .22 or over (the absolute value of a correlation significant at the .05 level) are shown for each factor.

The ten factors that were found and their identification and interpretation are presented below. The three columns of information in each case are the criterion number, the criterion score, and the factor loading (as shown in the headings for the first factor).

Factor A: Oral Communication Ability. The criteria with high loadings on this factor are as follows:

<u>Criterion Number</u>	<u>Criterion Score</u>	<u>Factor Loading</u>
58	Sit. I. Conference	.78
81	Speaking Organization	.75
84	Sit. XVII. Written Interp.--idea	.63
77	Sit. XVI. Adm. Discip. Action	.60
62	Sit. III. Lecture-speaking	.57
68	Sit. VII. Emergency Telephone	.48
80	Writing Organization	.34
66	Sit. VI. Desig. Leader--total	.27

Most of the variables which compose this factor deal in one form or another with oral communication. Some of these criterion scores also involve several components or characteristics of talking, such as voice quality, quality of material communicated, dynamic personality characteristics, demeanor, and oral fluency. For this reason this factor may be a somewhat general oral communication ability factor, which might alternately be described as a general talking ability factor.

Factor B: Written Communication Ability. The criteria with high loadings on this factor are as follows:

78	Sit. XVIII. Writing II	.76
75	Sit. XIV. Writing I	.73
70	Sit. IX. Written Exposition	.73
59	Sit. II. Oral Reading	.71
80	Writing Organization	.66
62	Sit. III. Lecture--speaking	.59
74	Sit. XIII. Reading Compreh.	.59
66	Sit. VI. Desig. Leader--total	.38
69	Sit. VIII. Plan. Inform. Paper	.36
82	Sit. XVII. Written Interp.--interest	.35
81	Speaking Organization	.31
73	Sit. XII. Interview Listening	.28
77	Sit. XVI. Adm. Discip. Action	-.28
60	Sit. III. Lecture--ideas/notes	.26
76	Sit. XV. Editing	.24

All of the criterion variables that were scored for characteristics related to writing ability appeared on this factor. Like the scores in Factor I, several were composite scores of various components of the writing area. Thus it seems that this factor could be identified as general writing ability. Several speaking scores also loaded on this factor; these, however, also included some components (such as ability to organize information) which seem to be similar to those related to writing abilities. This factor could be something more general, such as an "expression" factor; but since more writing than speaking variables loaded highest on this factor, it is identified as primarily a general writing ability factor.

Factor C: Idea Retention Facility. The criteria with high loadings on this factor are as follows:

61	Sit. III. Lecture--ideas/oral	.83
60	Sit. III. Lecture--ideas/notes	.76
83	Sit. XVII. Written Interp.--distort	.32
74	Sit. XIII. Reading Compreh.	.31
69	Sit. VIII. Plan. Inform. Paper	.28
63	Sit. III. Lecture--distortion	-.27
78	Sit. XVIII. Writing II	.25
68	Sit. VII. Emergency Telephone	.24

There are probably many different abilities that can function in dealing with ideas in one way or another. The main ability in this factor seems to be one requiring the facility to capture and retain ideas. Nearly all of the variables which loaded over the



arbitrary cut-off seem to involve this ability. The two highest loadings cover both the listing and the presentation of ideas so that retention seems to be required in both of these activities. For example, in Situation III, as in several of the others, the materials were presented so that the subjects merely had to extract and present the ideas, rather than create them. Other criterion scores that loaded on this factor also seem to involve a retention component of given ideas and do not require the individual to come up with his own ideas.

Factor D: Focus on Reception Over Expression. The criteria with high loadings on this factor are as follows:

72	Sit. XI. Identification of Sounds	.78
64	Sit. IV. Instruct. On-the-Job	-.76
82	Sit. XVII. Written Interp.--interest	.32
59	Sit. II. Oral Reading	-.31
71	Sit. X. Control Tower Listening	.26
77	Sit. XVI. Adm. Discip. Action	.23

This factor involves the two channels of speaking and listening, but in a rather limited area which may be a single dimension within itself. Since so much communication involves talking and listening, perhaps one who concentrates on accurate listening reception and retention of materials may do so somewhat at the expense of oral expression of materials, and vice versa. The negative relationship between expression and reception tasks, however, is not found for all tasks of these characteristics. Perhaps it should be noted that the correlation between the two listening scores on this factor, namely, 71 and 72, is only .25, so it is possible for some listening tasks to be more related to certain speaking tasks than to other listening tasks. The opposite pole on this factor would show the focus on oral expression over listening reception, or perhaps, more generally, of expression over reception.

Factor E: Attention on Accuracy of Details. The criteria with high loadings on this factor are as follows:

76	Sit. XV. Editing	.79
71	Sit. X. Control Tower Listening	.56
83	Sit. XVII. Written Interp.--distort	-.48
75	Sit. XIV. Writing I	.38
66	Sit. VI. Desig. Leader--total	(-.21)
68	Sit. VII. Emergency Telephone	(.21)

It seems that all these scores involve the elements of accurate attention to or retention of details in the communication materials. This interpretation is especially supported by the negative loading

of score 83 pertaining to addition and distortion. In order to perform well in the editing task, and also in the particular listening task, the individual probably must have a capacity for accurate grasp and retention of ideas or details in the materials, and yet not be prone to modify them to the extent of distorting the original ideas. Likewise we may say that a proneness to add to or otherwise distort facts and ideas in transmitting them to others is often associated with a degree of weakness or perhaps negligence in grasping and remembering the content of communications.

Factor F: Transmission of Information. The criteria with high loadings on this factor are as follows:

73	Sit. XII. Interview Listening	.70
83	Sit. XVII. Written Interp.--distort	.59
66	Sit. VI. Desig. Leader--total	-.52
69	Sit. VIII. Plan. Inform. Paper	.47
82	Sit. XVII. Written Interp.--interest	.30

With the exception of score 66, information is provided to the subject and his task is to assimilate and reproduce the information in a prescribed manner. In Situations VIII and XVII the purpose was to relay the information to others. In Situation XII the information was not relayed to others in the true sense, but it did require the assimilation of information, which is the all important first part of the information transfer process.

Factor G: Quality of Communication in Leadership Actions. The scores with high loadings on this factor are as follows:

65	Sit. V. Emergent Leader	.87
69	Sit. VIII. Plan. Inform. Paper	.43
84	Sit. XVII. Written Interp.--idea	-.34
58	Sit. I. Conference	.30
68	Sit. VII. Emergency Telephone	.24

All of the positive loading variables seem to involve leadership activities related to communication. The Emergent Leader situation was scored especially for the issuance of suggestions or commands for actions of the group--activities important to good leadership. In scores 58, 68, and 69 it might also be assumed that an individual who is effective in the communication of leadership actions or activities involving some degree of responsibility would also score well in these situations.

Factor H: De-emphasis of Details in Oral Communications. The criterion scores with high loadings on this factor are as follows:

79	Sit. III. Lecture--errors	.78
68	Sit. VII. Emergency Telephone	.40
66	Sit. VI. Desig. Leader--total	-.38
71	Sit. X. Control Tower Listening	-.27
81	Speaking Organization	.25
74	Sit. XIII. Reading Compreh.	-.22

This is a difficult factor to interpret since score 66 loads as highly as score 68 but in the opposite direction. Although they were scored for different features, they were both talking tasks scored on aspects relevant to the performance of individuals in positions of responsibility. However, since score 79 and score 68 which had the highest loadings did not seem to reflect close attention to details, the factor is identified by this characteristic. Perhaps better performance in the Emergency Telephone situation as scored, was to be able to phone a greater number of persons and give each one in turn the general picture of the airplane crash without wasting time or getting lost unnecessarily in details with anyone. This factor appears to be much like Factor E, but the score loading on the present factor deals more with oral communication, with an emphasis on giving the broad general picture more than on compulsively holding onto and perhaps getting too involved in all of the details. A more positively-oriented interpretation would be that the factor calls for the capability of bringing out the highlights and general messages effectively--if necessary, by not worrying much about the details.

Factor I: Distortion of Information. The criteria with high loadings on this factor are as follows:

63	Sit. III. Lecture--distortion	.80
82	Sit. XVII. Written Interp.--interest	-.45
83	Sit. XVII. Written Interp.--distort	.31
80	Writing Organization	-.23

This factor seems to be a distortion factor in view of the loading of both distortion scores (from oral and from writing tasks) in the criterion battery. Distortion was defined as any statement modified or even contrary to the information and meaning provided, and also addition of any information that cannot be logically assumed from the content. On this factor this distortion tendency is related negatively to the interestingness of a re-written directive, so consistency and accuracy of content here is positively related to the interest score on the content.

Factor J: (uninterpreted). The criteria with high loadings on this factor are as follows:

67	Sit. VI. Desig. Leader--status	.91
77	Sit. XVI. Adm. Discip. Action	-.31
74	Sit. XIII. Reading Compreh.	.30
62	Sit. III. Lecture--speaking	.24

In view of the high loading of score 67 one might be tempted to interpret this as a status-seeking factor. This would seem to be an appropriate interpretation also in view of the content and loadings of the other variables. Those who deliver a good lecture and who read accurately may have an above-average desire for a status reward. And those who do best in dealing with disciplinary cases may be those who have no great need to make status-seeking statements. However, we are hesitant in interpreting this factor since the other factor loadings were low. They were simply the number of remarks made by the subject that attempted to ensure or increase his status without directly helping the completion of a job. The mean score was 1.07 comments per examinee, so inferences based on such a low frequency of occurrence may be unwarranted.

#### Summary of Factor Analysis of Criteria in Battery C

The 10 factors found solely in the criterion domain of 27 criterion scores were most interesting and tie across rather clearly to some factors in the entire Battery C factor study reported above. These factors tend to be complex ones and the large number of factors for only 27 criterion scores (1 factor per 2.7 scores) speaks clearly of the complexity of the criterion domain investigated.

One factor deals primarily with speaking ability while a second primarily involves writing ability. There was still a third factor which seemed to include both expression and reception scores, and it was, therefore, interpreted in terms of these two classes of scores. The other factors are apparently more characteristic of two or more channels of communication than they are of any particular channel. For example, information can be distorted either in written or in spoken form; and details can be de-emphasized either in written or in spoken communications. From the factor analysis it seems that the domain of communication was covered quite adequately on the criterion side for a first exploratory study.

A list of the 10 factors is given below in the left hand column with somewhat comparable factors from the total Battery C study being listed in the right column whenever such linkages existed.

<u>Factors from Battery C Criterion Scores Only</u>	<u>Factors From Com- plete Battery C</u>
Factor A: Oral Communication Ability	Quality of Verbal Expression (P)
Factor B: Written Communication Ability	
Factor C: Idea Retention Facility	Idea Extraction and Thinking Abilities (L)
Factor D: Focus on Reception over Expression	(Neg.) Excessive Focus on Oral Presentations (R)
Factor E: Attention on Accuracy of Details	Attention to Detail (J)
Factor F: Transmission of Information	Concentration and Efficiency in Dealing with Messages (O)
Factor G: Quality of Communication in Leadership Actions	Command Supervisory Ability (Q)
Factor H: De-emphasis of Details in Oral Communications	
Factor I: Distortion of Information	Distortion Tendencies (I)
Factor J: (uninterpreted--possibly a status-seeking factor)	

In the two lists above one can see that every factor except two in the present criterion factor study had a fairly clearcut counterpart in the factor analysis of the total 87 scores in Battery C. The present study generally did not contain the simpler aptitude-test type of factors found in Batteries A and B and to some degree also in the complete Battery C. Instead these linkage factors tend to be like situational tests in nature and thus resemble the more complex sounding factors of job-like character found in the complete Battery C analysis.



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