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ABSTRACT

The second phase of a project concerned with how background and ability measures relate to job performance, this report discusses the occupation of Cartographic Technician (GS-1371). A description of the sample studied, the selection of measuring instruments, the predictor battery, criterion measures, and personal history questionnaires are provided. Three appendixes present Performance Rating Scales (TM 001 463), Work Samples (TM 001 464), Personal History Questionnaires (TM 001 465 and 466). (DB)

PR-71-22

PREDICTION OF JOB PERFORMANCE FOR BLACK, MEXICAN-AMERICAN, ANL CAUCASIAN CARTOGRAPHIC TECHNICIANS: INSTRUMENTATION DEVELOPMENT AND DESCRIPTION OF THE SAMPLE

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I. Introduction

A study of test and job performance of various subgroups within specified occupations was begun in late 1966, conducted jointly by Educational Testing Service and the U. S. Civil Service Commission. The project, concerned with how background and ability measures relate to job performance in three occupations in the Federal government for several ethnic groups, is supported by the Ford Foundation.

The first phase of the project was a study of the occupation of Medical Technician (GS-645), in Veterans' Administration hospitals. In this phase, the feasibility of gathering data on large numbers of Caucasian and Black employees was shown, and it was decided to proceed with two additional occupations. For description and results of the Medical Technician phase, see Pike (1969); Flaugher, Campbell, and Pike (1969); Campbell, Pike, and Flaugher (1969); Campbell, Pike, Flaugher, and Mahoney (1970); Rock, Campbell, and Evans (1970); and Parry and Mahoney (1970).

The occupation selected for study in the second phase of the project was Cartographic Technician (GS-1371). One of the major reasons this occupation was chosen was that there are large subgroups of Blacks and Mexican-Americans in this field. It was thought important to compare the relationships of predictors to job performance for an additional ethnic group, and also to see if the various types of relationships found for the Medical Technicians would be replicated for the Cartographic Technicians.

II. Description of the Sample Studied

Cartographic Technicians are employed in several government agencies: Department of the Army - Corps of Engineers and U. S. Army Topographic Command; U. S. Department of Commerce - the Coast and Geodetic Survey and the Bureau of Census; and the U. S. Department of the Interior - Geological Survey. Because of differing end products (aeronautical charts, topographic maps, etc.) and therefore different job orientations, it was decided to use as subjects for the principal part of the study only those technicians working for the U. S. Army Topographic Command (U. S. Army TOPOCOM).

A sample of Cartographic Technicians at the Coast and Geodetic Survey was used in a supplemental study. These subjects were given all of the aptitude tests and the Personal History Questionnaire, but the Technical Knowledge Questionnaire and the Work Samples, measuring instruments also used in the main study, were considered inappropriate to their job and were not administered.

Cartographic Technicians work in many phases of making new maps or revising existing maps. Their work may involve the collection, selection, adjustment, processing, and evaluation of source materials to be used in constructing maps, and the compilation, drafting, and editing of maps. Cartographic Technicians at U. S. Army TOPOCOM generally work in one of three divisions: Cartographic, Photogrammetric, or Geodetic (triangulation). Normal progression is from the former to the latter; that is, a person usually begins in the cartographic division, and may then move "up" to the photogrammetric division, and finally to the geodetic division. The largest number of technicians work in the first

division, the second largest in the photogrammetric division, and the smallest in triangulation. The sample of Cartographic Technicians chosen reflected these proportions.

Cartographic Technicians at four U. S. Army TOPOCOM locations were used as subjects for the main study: Washington, D. C., and three field offices - San Antonio, Texas; Kansas City, Missouri; and Louisville, Kentucky. (Technicians at the Providence, Rhode Island field office were used in a pretest of the Technical Knowledge Questionnaire and the Work Samples.)

Of about 1,000 Cartographic Technicians at the four locations mentioned above, a sample of approximately 440 was tested. Since the testing required about one and one-half days' time per subject, time spent away from their regular job was a necessary consideration. It was therefore judged feasible to gather data on only about half of the technicians.

The sample was selected from all those technicians who had filled out a preliminary background questionnaire (sent to all technicians employed at U. S. Army TOPOCOM in August, 1968), plus a few newer employees. The total sample consisted of 99 Mexican-American technicians (nearly all from the San Antonio field office), 101 Blacks, and 241 Caucasians.

All available technicians at San Antonio were tested, regardless of ethnic group or area of specialization, with a final sample of 122 of the 130 employed there. At the other three locations, all Black technicians available during the testing period were included in the sample. Caucasian technicians were selected who were similar in GS level to that of the Black technicians, and at a ratio of about two Caucasians for every Black.

The resulting sample at the other three locations included 167 technicians of 564 at Washington, 77 of 146 at Kansas City, and 75 of 143 at Louisville.

For the supplemental study at the Coast and Geodetic Survey in Silver Spring, Maryland, all Cartographic Technicians available at the time of testing were included, a total of 98. This number included 9 Caucasian deaf-mutes. This group possibly had difficulty in understanding the directions given for the tests, although the directions were interpreted in sign language for them. A preliminary analysis showed that their mean test scores were substantially lower than were the means for the others tested, so this group was excluded in further analyses (see Table 1).

Table 1

Description of the Sample by Ethnic Group and Total

U.S. Army TOPOCOM	Black	Mexican-American	Caucasian	Total
Washington	53	0	114	167
Kansas City	21	0	56	77
Louisville	25	0	50	75
San Antonio	2	99	21	122
Total	101	99	241	441
Coast and Geodetic Survey				
Silver Spring	38	0	60*	98*

*Includes 9 deaf-mutes, excluded from the comparative analyses

Table 2 shows the breakdown by grade level of the technicians by ethnic group and the total group, not including the Coast and Geodetic Survey group. While technicians from grade 5 through grade 12 were included in the sample, 24 percent of the total group were in grade 7 and 60 percent were in grade 9.

Table 2

Distribution of Grade Level of Technicians
by Ethnic Group and Total

Grade Level	Black	Mexican American	Caucasian	Total
GS-5	0	0	12	12
6	0	0	1	1
7	32	17	56	105
8	10	0	19	29
9	51	81	131	263
10	0	0	1	1
11	5	0	19	24
12	1	0	0	1
Total	99	98	239	436

The numbers in the two tables differ slightly because of missing data.

III. Selection of Measuring Instruments

The measuring instruments used in this study consisted of a battery of aptitude tests, a Personal History Questionnaire, a Technical Knowledge Questionnaire, three work sample tasks, and job performance rating scales. The instruments selected or developed especially for this study are described in separate sections below.

Prior to the selection of the aptitude tests and the development of the other measuring instruments, ETS staff members visited six government mapping installations. They observed the Cartographic Technicians on the job, and also interviewed some of the technicians, supervisors, and personnel staff. An effort was made to gain as thorough an idea of the job as was possible, including the types of skills needed for the job, kinds of possible tasks involved, and aspects of the job which were thought most important for successful performance as Cartographic Technicians. Knowledge gained from the Medical Technician study was also of great value in planning the instrumentation for the Cartographic Technician study.

IV. The Predictor Battery

A battery of 13 aptitude tests was selected to measure abilities thought relevant to the job of Cartographic Technician. Several criteria were considered in selecting the tests. Time required to take the test was one important basis for selection. Since a rather large battery of tests measuring a variety of abilities was desired, only tests with short time limits were chosen. Ease of group administration and face validity were also felt to be important. Availability of tests with two separately

timed halves, facilitating reliability estimation, and speeded versus unspeeded tests were other considerations.

Ten of the tests were chosen from the French et al., Kit of Reference Tests for Cognitive Factors. These tests have short time limits, are divided into separately timed halves, are as factorially pure as possible, and can be group-administered easily. Since the tests were designed for research purposes, the subjects used in this study would probably not have taken them previously. The Coordination Test of the Flanagan Industrial Tests series was also selected. This is a short, group-administered test of ability to coordinate hand and arm movements smoothly and accurately. Two U. S. Civil Service Commission tests were also used, Test No. 24 - Arithmetic, and Test No. 135 - Following Oral Directions. These tests were included because it was felt they measured aptitudes important to the job being studied. They have short time limits, and are easily group-administered. It was possible although not likely that some of the Cartographic Technicians may have taken the last two tests previously.

The total time required to administer the battery, including giving instructions, was about three and one-half hours. The Technical Knowledge Questionnaire and the Personal History Questionnaire were administered along with the aptitude battery, making the testing time about five hours. The tests with the factors they represent are listed below in the order in which they were administered:

Factor and Test

(1) Hand-Arm Movement Coordination
FIT Coordination

(2) Factor Cf: Flexibility of Closure
Hidden Figures Test (Cf-1)

(3) Factor V: Verbal Comprehension
Vocabulary (V-2)

(4) Factor Ma: Associative (Rote) Memory
Object-Number Test (Ma-2)

(5) Factor S: Spatial Orientation
Card Rotations Test (S-1)

(6) Number Facility
USCSC Test No. 24, Arithmetic

(7) Factor Ss: Spatial Scanning
Map Planning Test (Ss-3)

(8) Factor Vz: Visualization
Surface Development Test (Vz-3)

(9) Factor Ss: Spatial Scanning
Maze Tracing Speed Test (Ss-1) (Unspeeded-
5 min. each part instead of 3 min.)

(10) USCSC Test No. 135, Following Oral Directions

(11) Factor P: Perceptual Speed
Identical Pictures Test (P-3)

(12) Factor V: Verbal Comprehension
Extended Range Vocabulary Test (V-3)
(Unspeeded - 10 min. each part instead of 6 min.)

(13) Factor R: General Reasoning
Necessary Arithmetic Operations Test (R-4)

Description of the Aptitude Tests

The aptitude tests are described in more detail in this section. They are in the order administered except where grouped for description.

Since the ability to coordinate arm-hand movements well seems important to the job of Cartographic Technician, the Flanagan Coordination Test was included.

The Hidden Figures Test was chosen to measure the ability to identify configurations in spite of perceptual distractions. Much of

cartographic work involves extracting detail from aerial photographs, requiring skill in pulling out salient terrain features from a background that is frequently indistinct.

To determine if speededness makes a difference in the predictive value of a test or if there is a difference in performance among ethnic groups on two similar tests, one speeded and one unspeeded, two pairs of tests were selected. One pair of such tests measured the Verbal Comprehension factor. The Vocabulary Test was given as a speeded test, and the Extended Range Vocabulary Test was made essentially unspeeded by extending the time limit. Both tests measure the ability to understand the English language. Since it is necessary on this job to follow both oral and written instructions, and to understand a variety of written specifications, this factor was felt to be very important. It may also relate to the ability to comprehend and communicate with others in the technical jargon used on the job.

Memory was also felt to be an important factor in performing the job efficiently. For example, a technician must refer constantly to books of written specifications, and the more he can remember, the less time he wastes having to look them up. This factor may also relate to ability to form and remember new associations quickly. The Object Number Test was selected to measure the aptitudes necessary to master this aspect of the job.

Spatial orientation, the ability to perceive spatial patterns or to maintain orientation of objects in space, was also felt to be relevant to the job of making maps. This was measured by the Card Rotations Test.

Many technicians have to do numerical computations as part of their job, for example, figuring the ground distance between two objects based on the scale of the aerial photographs being used. The USCSC Test No. 24, Arithmetic was selected to tap this ability.

The other pair of tests chosen for comparison of speeded and unspeeded effect on predictability taps the Spatial Scanning factor. The Map Planning Test was given as a speeded test, and the Maze Tracing Speed Test was given essentially as an unspeeded test by increasing the time limit. This factor pertains to the ability to explore visually a wide or complicated spatial field, an ability felt to be important for cartographic work.

The Surface Development Test was chosen to measure the technicians' ability to manipulate the image of spatial patterns into other visual arrangements. This was also thought to be an important aspect of cartographic work.

Since supervisors give many oral instructions to their technicians, the Following Oral Directions test was also included in the battery. This test measures ability to carry out instructions appropriately when directions are given in the oral mode only.

The job of Cartographic Technician depends a great deal on close, accurate visual work. To test speed in making comparisons such as might be used in ensuring that detail from an old map is placed correctly on a revised map, the Identical Pictures Test was used.

General reasoning was tested using the Necessary Arithmetic Operations Test. For this test, the examinee has only to decide whether to add, subtract, multiply or divide to solve arithmetic problems; a numerical answer is not required.

V. Criterion Measures

Three types of criterion measures were developed for the study: (1) A test of basic cartographic knowledge (Technical Knowledge Questionnaire), (2) performance rating scales, and (3) three work sample tasks. Considerations in their selection and development are discussed under the main headings below.

Technical Knowledge Questionnaire

A test of basic cartographic knowledge was developed especially for this project as a criterion measure. ETS staff members worked with three cartographers from U. S. Army TOPOCOM, one from each of the major divisions where Cartographic Techniciars are employed: carto-graphic, photogrammetric, and triangulation. Each of these carto-graphers had knowledge of the work done in the other divisions, and could therefore work effectively as a team in writing test items. An effort was made to have the test content pertain to the types of infor-mation necessary for successful job performance. Many items involved the use of diagrams to assess the technician's ability to interpret contour lines, map symbols, and charts.

About 200 multiple choice items were written. Some of the items developed were adapted from U. S. Army TOPOCOM Training Center materials, and many items were new. The majority of questions written covered the work in the cartographic area, where the largest number of technicians work and, as previously explained, is the entry level for this job. About half as many photogrammetric items were written, and only about 10 triangulation items.

ETS staff members edited all the items, randomized the alternatives, and then arranged the items into subject matter categories within the three major areas. About 20 items were eliminated because they were too similar to other items, were too long or complicated, or were felt to contain ambiguities.

The items were then reviewed by three additional cartographers at U. S. Army TOPOCOM. The accuracy of the stem, keyed answer, and inaccuracy of the distractors were checked for each item. Any items felt to be ambiguous were either clarified or omitted, and those where the correct answer could not be agreed upon were eliminated. About 15 new items were written in several areas not covered by the other items.

The resulting 165 items were put into two test forms, the items divided by subcategory within the major areas of cartographic, photogrammetric, and triangulation. (It was decided to pretest all items, and they were divided into two test forms only to make the test shorter to administer.) The two forms were pretested at the Providence, Rhode Island field office of U. S. Army TOPOCOM. Each form was given to 40 Cartographic Technicians, about half of whom were currently working in the cartographic division and half in the photogrammetric division. All technicians had worked in the cartographic area at some time, so the analysis of these items was based on all the subjects. For the photogrammetric items, only data from those who had worked in that area were considered, an N of 25 for each form.

Within each subcategory, about half of the items were chosen for the final form on the bases of how well the items discriminated between the high and low groups and item difficulty (the total number of technicians getting an item correct.)

The final Technical Knowledge Questionnaire consisted of 75 items; 52 items covered cartographic work (average difficulty 63 percent) and 23 items covered photogrammetric work (average difficulty 58 percent). (The difficulty of an item was defined as the proportion of technicians answering the item correctly. The average difficulty of all items was the sum of these difficulty values divided by the number of items.) The triangulation items were not included in the test because there were not enough technicians working in triangulation, especially when divided into ethnic subgroups, to warrant meaningful analyses of a triangulation section of the test. For the final form, items were arranged by subcategory within the two major areas. Difficulty of each item was not taken into account when ordering items.

Performance Rating Scales

Eight rating scales were developed for this study, seven measuring specific aspects of job performance with an additional scale for an overall rating. The scales were based on interviews with Cartographic Technicians and their supervisors and observation of the job, and were to be used by supervisors to rate the job performance of technicians working under them.

The same anchored rating scale format was used for the Cartographic Technician study as was used for the Medical Technician study. Although some of the same characteristics were felt to be important for both jobs, several new scales were added. All scales and behavioral examples were redefined in terms of the Cartographic Technician job requirements.

The scales developed for use with the Cartographic Technicians were for Accuracy, Interest, Learning Ability, Technical Knowledge, Manual Dexterity, Need for Supervision, Perseverance, and Overall Performance. Each of the eight scales was presented on a separate page. For each scale, a short paragraph at the top of the page described the characteristic to be rated, and gave examples of effective and ineffective behavior. Centered below this paragraph was a vertical line divided into nine intervals, unnumbered. For Scales 1 through 7, further illustrations were given in paired statements at the high, middle, and low points of the scale. The statements on the left of the scale were general descriptions of performance, while those on the right side served as examples of behavior. The descriptive paragraphs at the top of each scale and the illustrations along the vertical line were specific to the work of Cartographic Technicians. For Scale 8, the Overall rating, five unpaired statements were given, illustrating five different levels of performance. The scales were not labeled in the rating booklet, so that the supervisors doing the rating would be more likely to make their ratings on the basis of the descriptions of behavior given than on their interpretation of a label provided.

A paragraph describing the performance of a fictitious technician, Mark Bench, was given for the first seven scales. For each of these scales, specific examples of Mark's behavior pertaining to that characteristic were given. The supervisors were asked to rate Mark based on these paragraphs, and to rate Mark on the Overall scale using the descriptions given for the previous scales. Ratings given

to Mark were to be used as a basis for adjusting the actual technicians' ratings to help eliminate the effects of stylistic variation or bias in supervisors' rating behavior.

Detailed instructions were given in the beginning of the booklet, and a list of technicians to be rated along with identification numbers assigned to them, were at the end of the booklet. For each technician being rated, the supervisor was asked to indicate the length of time he had supervised the person, and then rate him on the eight scales. The supervisor was also asked to give Mark Bench a rating on Scales 2 through 8 (a rating had been given to Mark on Scale 1 as an example). Ratings were to be indicated by placing an "X" and the number identifying the ratee beside the vertical line for each scale.

Importance Rating Scales: After each supervisor had completed rating his technicians, he was asked to indicate how important he felt each of the seven qualities (described in the first seven rating scales) would be in overall job performance as a Cartographic Technician. These "importance ratings" were recorded on a separate piece of paper, by placing an "X" at the appropriate point on a 10-point scale given for each quality. The scales were anchored by three descriptions: "Not Important. Irrelevant to Proper Job Performance," "Important. Contributes to Proper Job Performance," and "Very Important. Essential to Proper Job Performance."

Copies of the rating booklet and the Importance Rating form are included as Appendix A.

Work Samples[1]

Three work sample tasks were selected: a logical contouring problem, a "pull-up" from an aerial photograph, and a geometric restitution task. A great many components and skills are involved in the complex job of producing maps. The directors of the three divisions employing Cartographic Technicians at U. S. Army TOPOCOM in Washington and some of their staff met with ETS representatives and discussed possible criteria and the kinds of tasks that might be used as work samples.

The three work samples were chosen from many possible tasks through the application of a number of criteria. It was felt that each task selected should be:

1. Realistic. The work samples chosen should closely approximate what Cartographic Technicians actually do on the job, and the tasks should be meaningful parts of their work.

2. Fair. All technicians should have some familiarity with the tasks chosen as work samples.

3. Standardized. The work samples selected must be able to be administered in a standard fashion or be able to be placed on a standard scale.

4. Scorable. The samples must have characteristics that will allow them to be scored reliably. These characteristics must be such that a reasonable spread may be expected in the scores.

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[1]The original draft for this section of the report was written by David Nolan, and he had the major responsibility for selecting the work samples with the representatives from U. S. Army TOPOCOM.

5. Confidential. To obtain cooperation from the technicians, it was necessary to promise that their own supervisors and directors would not see their work. Thus, it was necessary to select tasks that could be administered away from their work location, and scored without using U. S. Army TOPOCOM staff.

6. Short in duration. This was not an overriding criterion but was applied in cases where all other things being equal, the task having the shorter time requirement was chosen.

An obvious possibility to consider when selecting work samples was the use of pieces of actual work which had been done recently. Before any real effort was made to apply the above criteria to such a possibility, a criterion of higher precedence overruled. The security rules and procedures of U. S. Army TOPOCOM made it impossible to examine some of the recent work, to say nothing of moving it elsewhere in order to judge its usefulness and ultimately to score it. Since actual work could not be used as work samples, it was necessary to use tasks which would be completed by the technicians as part of this research study. Each task selected was tried out on a small sample of technicians at U. S. Army TOPOCOM in Washington and Providence, Rhode Island, to test its appropriateness and to determine the range of time required for completion of the task. Each of the three tasks selected required about one hour to finish.

One of the tasks which met the established criteria was a logical contouring problem. The task involved drawing contour lines without the aid of stereoscopic equipment or aerial photographs but with certain elevations and the basic drainage pattern of the terrain given. The

kinds of decisions and understandings involved in such a task are part of many mapping assignments. The drainage pattern and spot elevations were presented on a plastic sheet, and the technicians were asked to compile the contour lines at 20-foot intervals on a plastic overlay.

A geometric restitution task was also selected. A common job at U. S. Army TOPOCOM is revising old maps through the use of recent aerial photographs. Often the only available new information is in the form of an oblique photograph. It is necessary to reconstitute the information from the oblique format to the vertical, a process called geometric restitution. Each technician was given two plastic sheets. Plate A represented a portion of a large scale (orthogonal) map, with a minimum amount of cultural detail. Plate B represented a later date pull-up from an oblique photo of the same area, with more cultural detail given. The task was to use geometric restitution to add the new cultural detail to its proper position on Plate A. The new detail was to be compiled on a blank plastic worksheet.

The third work sample consisted of a "pull-up" from an aerial photograph, a common job in the cartographic division. The task consists of picking up details from some source document for purposes of revising an existing map or for creating an entirely new map. Frequently the source documents are vertical aerial photographs. Each technician was given three overlapping aerial photographs, and a hand stereoscope. He was asked to compile on an overlay sheet the drainage system and cultural detail from the middle photograph that should appear on a 1/25,000 scale map. U. S. Army TOPOCOM provided the aerial

photographs, printed on a special distortion free material so that standard scoring templates could be used on the finished work. They also provided the stimulus materials for the other two tasks.

A number of other tasks were considered but were eliminated for failure to meet the criteria or simply because it was felt that they would not be as valuable as the three already selected.

The work samples are presented in Appendix B.

VI. Personal History Questionnaires

Two questionnaires dealing with personal history were included in this study to determine if certain background variables affect prediction of job performance. The information obtained from the questionnaires is also of interest in describing the types of people who enter the Cartographic Technician field in such terms as their education, work experience, and how they spend their time on the job.

Many of the items in the questionnaires were similar to those in the questionnaire used for the Medical Technician Study. Questions dealing with type of work done and the task list were, of course, different for this job. In addition, a series of questions relating to English language facility were included, since the sample contained a large number of Mexican-Americans.

The preliminary questionnaire was rather brief, and was sent to all Cartographic Technicians in August, 1968, with an N of about 1500. This number included technicians in U. S. Army TOPOCOM, Coast and Geodetic Survey, Bureau of the Census, and Army Corps of Engineers. (It was largely on the basis of these questionnaire results that the

decision was made to select only those working at U. S. Army TOPOCOM for the main study.) Questions covered a variety of areas: for example, GS level when hired by Federal Civil Service, present GS level, age, sex, education, training in cartography and related subjects, amount of experience, tests taken when hired, and types of maps worked with most frequently.

A 130-item task list was also included, developed from job specifications, personal observations, and interviews with technicians and supervisors. For each of the tasks listed, the respondent was asked to check "Often," "Sometimes," "Seldom," or "Never," to indicate how often he performed the given task during the past year. The task list information helped give an indication of which tasks are done most frequently, and also of differences in kinds of tasks done at different GS levels, or by the different ethnic subgroups, if any. Information on the tasks common to most of the technicians was very helpful in developing the Technical Knowledge Questionnaire and also in deciding which tasks should be used for the Work Samples.

The approximately 450 technicians at U. S. Army TOPOCOM selected for the sample were given a more complete Personal History Questionnaire. A few questions from the preliminary questionnaire were included, such as age, sex, and GS level. Additional questions dealt with parents' education and occupation, technicians' English language facility (how well they can read and converse in another language compared with English), level of education reached, and several questions about their high school education (area of study, type and location of the high school). Questions on cartographic training were concerned

with how much training was received before and after entering the job, place of training, college level study, tests taken when hired and level of mathematics used on the job. Experience and work history items asked such things as reason a career in cartography was chosen, GS level when entered and at present, number of years worked at each GS level, length of time in military service, and types of maps on which most time is spent. Although the areas covered in this questionnaire were similar to those in the preliminary questionnaire, there were more questions in each area, and more thorough information was obtained.

A copy of each questionnaire is presented in Appendix C.

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Appendix A

Performance Rating Scales

Name of Rater_____

Installation_____

JOB PERFORMANCE APPRAISAL FORM

FOR

CARTOGRAPHIC TECHNICIANS

Prepared by

Educational Testing Service

(Experimental edition - for research purposes only)

PR-71-22
Appendix A
Exhibit A-1

26 A

PURPOSE OF THE RATINGS AND HOW TO USE THE RATING SCALES

Purpose: As you know, we are giving a number of tests to cartographic technicians as part of a research project. These tests measure certain aptitudes and abilities, but not how well each person does his job. We want to find out whether these aptitudes and abilities are related to job performance. In order to do this, we need your help in rating the cartographic technicians in your section on each of seven characteristics considered to be important aspects of job performance and then on their overall job performance. You are also being asked to rate the performance of a fictitious person named Mark Bench, based on descriptions of him and of his work. We will use this rating as a reference point for comparing the ratings of many people in the locations included in this study.

The ratings you make will be used for research purposes only, and will not affect the job of any person. They will not be seen by anyone except members of the Educational Testing Service research staff. When you finish the ratings, insert the booklet in the envelope provided and seal it. It will not be opened until it reaches ETS in Princeton, New Jersey.

Description of the Rating Scales: Each of the eight scales is on a separate page and is described in a paragraph in which examples of effective and ineffective behavior are given. For Scales 1 through 7, further illustrations are given in paired statements at the high, middle, and low ends of the scale. The statements on the left side of the scale are general descriptions of performance, while those on the right side of the scale serve as examples of behavior. For Scale 8, the five unpaired statements illustrate five different levels of performance. For each scale, a description of Mark Bench and his work appears in a box on the lefthand page facing the scale.

General Directions for Rating: Please look at the last page. The names of the persons you are being asked to rate are listed at the bottom of the page with their assigned numbers, and can be seen as you proceed from scale to scale. Mark Bench has been assigned number 1. Please fill in the length of time you have worked with each other person listed in the space provided before proceeding with the ratings. If you do not know the work of some of the people well, please do not rate them. The persons you rate probably will not fit the illustrations exactly. These illustrations are only typical examples of behavior at the high, middle, and low points on the scale. You will have to make a judgment as to where each person best fits on the scale, and that may be somewhere between the levels illustrated. Try to avoid the tendency to rate everyone high or low, or to rate a person at the same point on every scale. Think about the aspects of the job which he does well and those he does less well.

How to Record Your Ratings: Make your ratings of all persons on one scale at a time. Turn to Scale 1. Read the description of the scale at the top of the page and the illustrations at the three scale points. Read the description of Mark Bench and his work on the lefthand page and note that we have entered a rating based on this description, as an example. Considering each person in turn, place an X on the scale at that point which in your best judgment represents his usual level of performance. Write the person's assigned number opposite the X as we have done for Mark Bench. If in your judgment more than one individual should be rated at the same point, write his number opposite that X also. Place X's on the scale for all the other persons. Try to consider differences among the individuals you rate on the aspect of performance being rated.

Now proceed through the other seven scales in the same manner, except that you are to rate Mark Bench also on these other scales, on the basis of the descriptions of him and his work in the boxes opposite each scale. After completing all the ratings, you may wish to go back through the scales to recheck your ratings and make any adjustments you feel might express your judgment more accurately.

If you have any questions, please ask the research person who is working on this program. If such a person is not available, make the ratings as best you can. Please write any questions or comments on the back of the booklet so they may be taken into account in using your ratings.

REMEMBER, THIS INFORMATION WILL BE KEPT CONFIDENTIAL AND WILL BE USED FOR RESEARCH PURPOSES ONLY. MAKE YOUR RATINGS AS FRANKLY AND HONESTLY AS YOU CAN.

Thank you for your cooperation.

Mark Bench usually does quite accurate work, but he occasionally makes mistakes and his work always has to be reviewed. Sometimes no errors at all are found. At other times he may misplace or omit significant features or misspell place names. Once in awhile he may misread the specifications or set up the plotter wrong.

Scale 1

Some cartographic technicians always can be counted on to produce correct work. You can be sure that they have checked their work, that no important information is lacking, and that they have included adequate control. Others are apt to read tables or other information incorrectly, misspell words when labeling maps, or use the wrong grid coordinates. When making this rating, consider the usual accuracy of this person's work rather than its artistic quality or overall appearance.

High degree of accuracy no matter how complex the task. Almost never makes mistakes.

This person can be trusted to turn out very accurate work.

Performs most tasks accurately, but sometimes makes mistakes.

1 X

This person can usually be counted on to place features correctly on a map, but he does make some mistakes.

Cannot be counted on to do accurate work. Seems to make many mistakes every day.

This person is careless in doing most tasks. When he makes mistakes, he doesn't even realize it, and can end up with features completely out of position.

Mark Bench really loves maps. He collects old maps and books about cartography and likes to show each new find to his less enthusiastic co-workers. He spends a lot of time reading and studying about maps and mapping, but it is not always relevant to the work he is doing. He is inclined to take more interest in his work if he can spend time figuring out how to use a new piece of equipment, assembling source material, making elaborate plans, and looking up specifications. He would like to leave the routine compiling to others, although it is part of his job.

Scale 2

Some people take a great deal of interest and pride in their work. They try to improve the quality of their work by study and practice. Others, regardless of their ability to do the work, do not seem to take an interest in it except as a way to earn a living. They carry out their assignments in a routine way, without enthusiasm or involvement. When making this rating, consider the person's interest demonstrated on the job, rather than the actual quality of his work.

Enjoys his work. Voluntarily takes steps to accomplish tasks without being asked. Shows some originality. Suggests innovations, and shares knowledge and skill with others.

This person makes suggestions for improving the work in his area. He shows concern for the outcome of the job. He takes advantage of all opportunities to improve his knowledge and skill.

Shows some interest in the work. Occasionally requires prodding from his supervisor. Does what is expected of him for the position he holds.

This person usually "lends a hand" when he is needed. He sometimes looks for additional work but sometimes does not.

Seldom shows any interest in his work. Gives the impression that he would rather be somewhere else.

This person does what he is told and no more. He sometimes neglects his duties and seldom shows interest in his work, often acting bored.

Because of his interest in maps and mapping, Mark Bench is the first to want to use new equipment, procedures, or techniques. After instruction in a new procedure, Mark usually rushes off to try it out. He often needs further help before getting the hang of it. He can learn facts well but has trouble understanding how to apply them to a problem.

Scale 3

Some people "catch on" to new procedures and new ideas very quickly with a minimum of instruction or explanation. They are able to read and understand specifications for a complex task when faced with it for the first time. Others seem unable to learn even after repeated explanations and practice. They have difficulty learning new tasks and in remembering changes in procedures. When making this rating, disregard experience and technical knowledge and appraise the person's ability to learn on the job.

Learns new techniques easily, and seems very quick to understand and comply with new procedures.

This person is among the first to learn a new procedure. He needs a minimum amount of instruction. For example, he might be the one selected by the supervisor to receive special instructions on the use of new equipment.

After some instruction, can perform tasks well and with understanding.

This person requires some help and practice in order to master new procedures.

Seems very slow to understand. Must constantly be shown how to do procedures or tasks that should be very familiar by now.

This person has difficulty learning new things. He needs a lot of help and practice if he is to perform a new task.

Mark Bench has an infinite capacity for facts of all kinds, which he is generous in sharing with others. He keeps his specifications and technical manuals up to date, and has assembled a library of reference books which he consults frequently. His understanding of the facts is not as good as his collection of them. As it is, he tends to speak authoritatively, but others do not always accept his opinion when trying to resolve conflicting sources of information.

Scale 4

Cartographic technicians must have technical know-how in order to do their jobs. Some are thoroughly familiar with the many specifications and technical manuals, and manage to keep abreast of current revisions. They can interpret and apply the information. Others do not seem to understand even what is "common knowledge" about their job or why certain things are done. When making this rating, appraise the person's technical knowledge and disregard other aspects of his work.

Has unusual comprehension of technical procedures involved in this work, and a good understanding of the basic principles behind them.

This person has a great deal of technical knowledge, and others in his area come to him with their questions. He has thorough knowledge of a wide variety of specifications, and can apply the information correctly.

Possesses essential technical information, but may not understand why things are done.

This person has an adequate familiarity with the instruments and tools and with tasks to be performed. He can recognize discrepancies, but may not know what to do about them.

Very spotty technical knowledge, restricted to only the most common information.

This person performs tasks purely by rote. He asks questions about things that should be common knowledge, and seldom seems to know where to go to get missing information.

When faced with an assignment requiring fine detail, crowded features, or the use of small equipment such as gravers, Mark Bench seems to be "all thumbs." His contouring is sometimes so messy that it looks like a pile of wet spaghetti and he has to re-do it several times before it is acceptable. His eye-hand coordination is off just enough so that he has difficulty putting stick up just where he wants it. On tasks where less precision is required, he produces quite acceptable work.

Scale 5

Some people work with a great deal of precision and skill. They use their tools and instruments well, and turn out even line weights, well-placed stick up, and other evidence of good eye-hand coordination. Others seem somewhat clumsy in handling their instruments and materials, and are not very precise or neat in the work they do. When making this rating, appraise the person's present ability to perform manual tasks and to handle tools and instruments.

Highly efficient in the use of equipment, tools, and materials, and in carrying out a variety of manual tasks.

This person would be among the first to be called on to perform tasks requiring accuracy as well as speed. He can perform complex assignments with deftness and competence.

Average skill in use of tools and equipment. Performs tasks adequately.

This person usually performs satisfactorily. Occasionally makes mistakes, but not very often. He successfully uses equipment and materials necessary for his work.

Has difficulty turning out a product that meets quality standards. Some tasks may be improperly carried out.

This person frequently bungles a job. He is rather clumsy and is limited in his use of equipment and tools.

Mark Bench likes to tackle fairly complex assignments and enjoys assembling and organizing the materials and specifications he needs. However, it is necessary for the supervisor to outline the assignment in some detail, with specific steps to be followed. Then Mark will proceed on his own to carry it out. If careful directions are not given, Mark will use his own judgment. His decisions are not always appropriate. It is always well to check at various stages to see what he is doing. He usually works without prodding, but is easily distracted if he has an opportunity to offer advice on someone else's work.

Scale 6

Some people need very little supervision. They follow directions closely and can be counted on to make sound decisions about their work. They go ahead on an assignment without waiting to be told what to do next, and edit their own work as it progresses. Others require constant supervision. They can complete their work only if each step is spelled out for them, and seem unable to make a decision without seeking aid. When making this rating, appraise the person's ability to assume responsibility and to make valid judgments regarding his work.

Sees what tasks need to be done and takes initiative in doing them without direction or supervision.

This person is a potential supervisor. You would expect him to act as a stand-in for the supervisor if necessary. He can be counted on to use good judgment in his work.

Follows directions closely. Brings irregularities or discrepancies to the attention of the supervisor. Figures out problems as far as he can, and then asks questions. Usually able to reach appropriate decision.

This person generally complies with rules and regulations. If he isn't sure about something, he will ask somebody to help him out. His decisions can be relied upon if the facts or situations are not very complicated.

Often finds it difficult to follow suggestions or directions. Needs his work structured to eliminate the necessity for decision-making.

This person sometimes overlooks indications that his work is not being completed properly. He requires frequent spot supervision, and almost always has to ask someone else what should be done.

Mark will work hard and long on what he considers a challenging assignment, and he may even work late to look up missing pieces of information or to resolve conflicting data. However, he soon loses interest in a routine compiling job or in a tedious job requiring precision and patience. He may spend time visiting or looking at reference books to avoid working on these jobs and occasionally takes a lot of time to turn in a finished product.

Scale 7

Some people show a great deal of stick-to-itiveness in their work, and are willing to keep on at a task until it is completed even if it is difficult, complicated, or perhaps not very interesting. Others tend to give up easily, or find an excuse not to finish. They may try to get out of a job that requires a lot of research, or may spend too much time "visiting" when faced with a boring assignment. When making this rating, appraise the person's patience and persistence in completing his assignments.

Shows a great deal of patience while doing his work, regardless of the task. Persists until the task is completed.	This person can be counted on to work on his tasks until finished. He does not complain about the assignments given to him, and works patiently on whatever he has to do.
Usually has patience, but sometimes tries to avoid doing or completing a particularly tedious job.	This person works patiently on some of his tasks, but may give up or try to get out of some of the more difficult tasks.
Has very little patience. Gives up easily.	This person shows very little patience in his work, and may complain or do a poor job.

Using the descriptions of Mark Bench and his work given for the previous scales, please give him an overall rating. This may not be a true evaluation of him as a cartographic technician, because you have never actually seen any of his work or have never met him in person. From your impression of him, rate him on this scale along with the other people in your group.

Scale 8

You have been asked to make ratings on some specific qualities that contribute to a person's performance on the job. Other qualities not included in these scales might be important in your judgment of a person's overall effectiveness as a cartographic technician. On this last scale, we are asking you to think of the total job a person is doing and how effective he is as a member of your work group. When making this rating, try to spread the ratings on the scale as much as you realistically can.

This is the most valuable person in our work area. He is an outstanding worker. This person would be missed most if he were to leave.

This is a very valuable person. His overall performance is above average, and we would be sorry to lose him.

This person is about average as a worker. We can certainly use people like him, but if he were to leave he could probably be replaced without much trouble.

This person's work is somewhat below average. It is seldom safe to depend on him for other than routine tasks. His work has to be constantly edited.

This person barely meets the minimum requirements of the job. He produces so little work of acceptable quality that if he were to leave he would not be missed.

FINAL INSTRUCTIONS

1. Check all the scales to make sure that each X has a number beside it.
2. Place this booklet in the envelope that has been provided.
3. Seal the envelope and write your name on the front of it.

Assigned Number	NAME OF PERSON TO BE RATED	How long have you supervised this person?
1	Mark Bench	
2		
3		
4		
5		

Assigned Number	NAME OF PERSON TO BE RATED	How long have you supervised this person?
6		
7		
8		
9		
10		

Exhibit A-2

Importance Rating Scales

You have provided ratings of the job performance of cartographic technicians on seven different scales plus an "overall" scale. The qualities or aspects of job performance described in the first seven scales probably vary in importance.

On the other side of this page, please indicate <u>how</u> important each of these qualities is to overall job performance as a cartographic technician, by placing an "X" at the appropriate point on the rating scale.

Name: _____

Installation: _____

	Not Important. Irrelevant to Proper Job Performance	Important. Contributes to Proper Job Performance	Very Important. Essential to Proper Job Performance
Scale 1 "...produce correct work..."			
Scale 2 "...interest and pride in their work..."			
Scale 3 "...catch on to new procedures and new ideas..."			
Scale 4 "...technical know-how..."			
Scale 5 "...precision and skill..."			
Scale 6 "...need very little supervision..."			
Scale 7 "...stick-to-itiveness in their work..."			

Appendix B

Work Samples

Exhibit B-1

Instructions

For Work Sample Administration

Distribute envelopes to each individual. Distribute triangles and 1 each black, green, and red pencils, and erasers.

Read:

> "Write your name on the outside of the envelope."
>
> "Today you are being asked to do three tasks which are similar to what cartographic technicians do on the job. I will now pass out the materials you will need for the first task. Please do not start work until I have read the instructions."

Pass out logical contour problem and 1 sheet of plastic. Distribute masking tape as needed.

Read:

> "Contour instructions
>
> 1. Compile contours at 20 foot intervals using control on the attached plate A.
> 2. Prepare contours on your blank plastic overlay in pencil.
> 3. Write your name in upper right hand corner.
> 4. You will have one hour on this project. You may begin."

Start timing 1 hour

At end of hour read:

> "Stop! Put your plastic overlay in the envelope. I will pick up the contour problem sheets and distribute the next problem. Do not start work until I read the instructions."

Distribute plates A and B for geometric restitution problem and one sheet of plastic.

Read:

"Restitution Instructions.

1. Plate A represents a portion of a large scale map.
2. Plate B represents a later date pull-up from an oblique photo of the same area.
3. Problem - using Geometric Restitution, add the new detail to Plate A.
4. Compile the new detail on the blank plastic worksheet in pencil.
5. Use your own judgment on any other questions or problems that might arise. Do not ask help from anyone.
6. Write your name in the upper right hand corner of the plastic worksheet.
7. You will have one hour to work on this project. You may begin."

At end of hour, read:

"Stop! Put your plastic worksheet in your envelope. I will take up the problem sheets and pass out the next problem. Please do not start work until I read the instructions."

Pass out plates 35, 36, and 37 and one sheet of plastic.

Read:

"Pull-up Instructions

1. Using your hand stereoscope compile in pencil all planimetric detail required on a 1/25,000 scale map from plate 36 on the plastic worksheet provided.
2. Compile cultural details in red with the exception of railroads which should be done in black. Compile drainage in green.
3. Write your name in the upper right hand corner. You will have 1 hour for this project. You may begin."

At end of hour, read:

"Stop! Put your plastic worksheet in your envelope and seal it. Be sure your name is on the envelope. I will now collect all the materials. Thank you very much for your cooperation."

CONTOUR INTERVAL = 20'

A

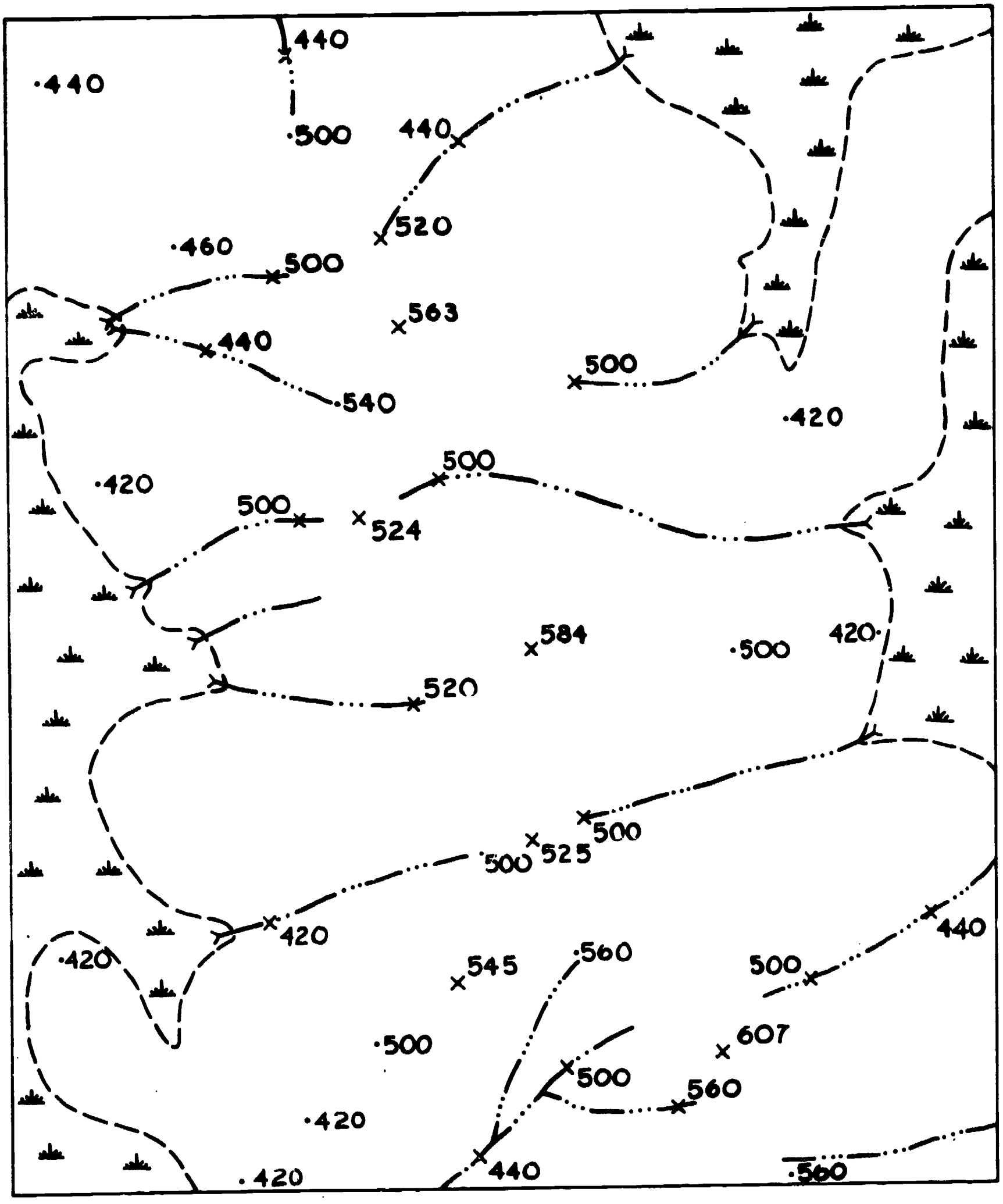
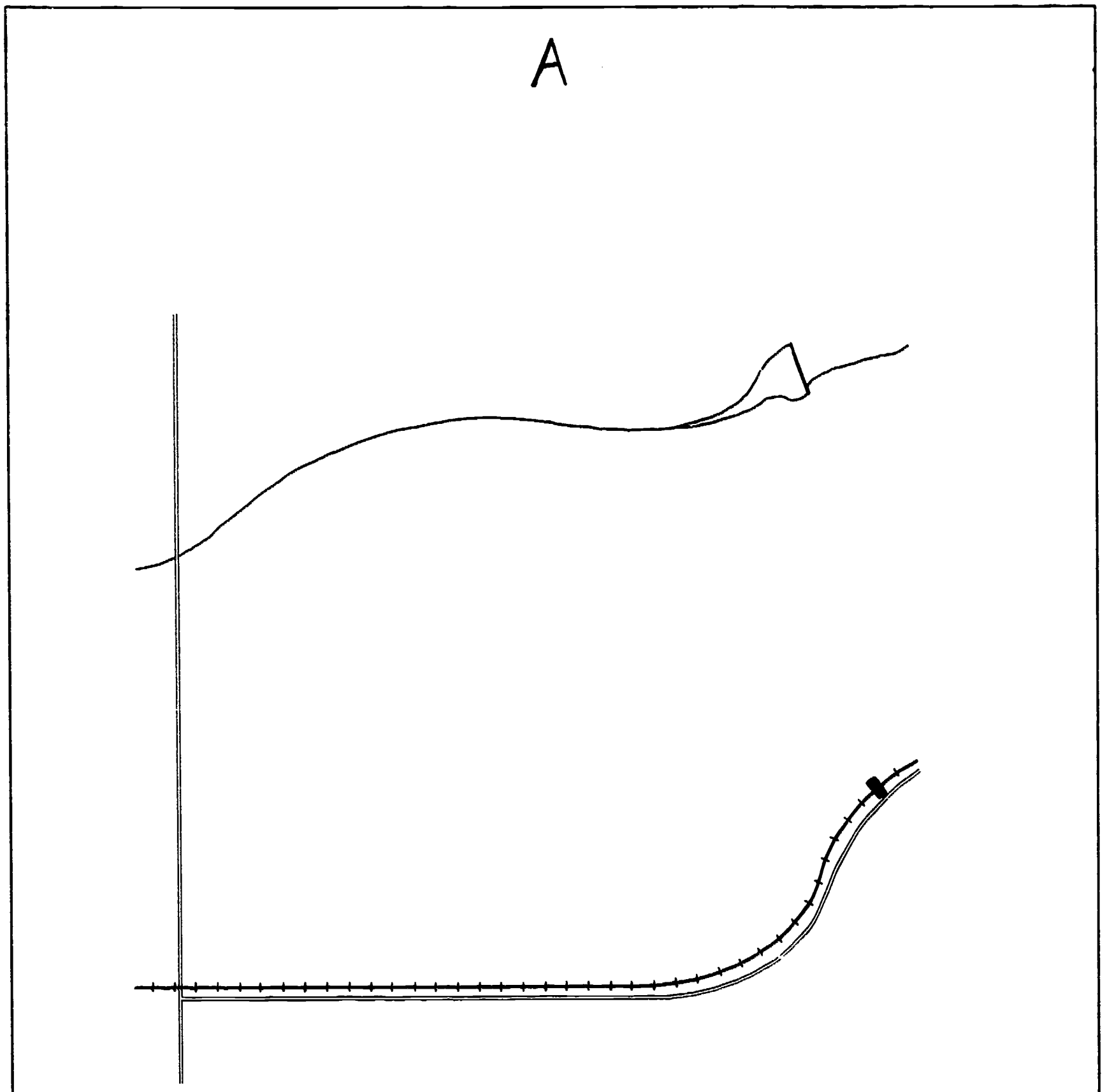
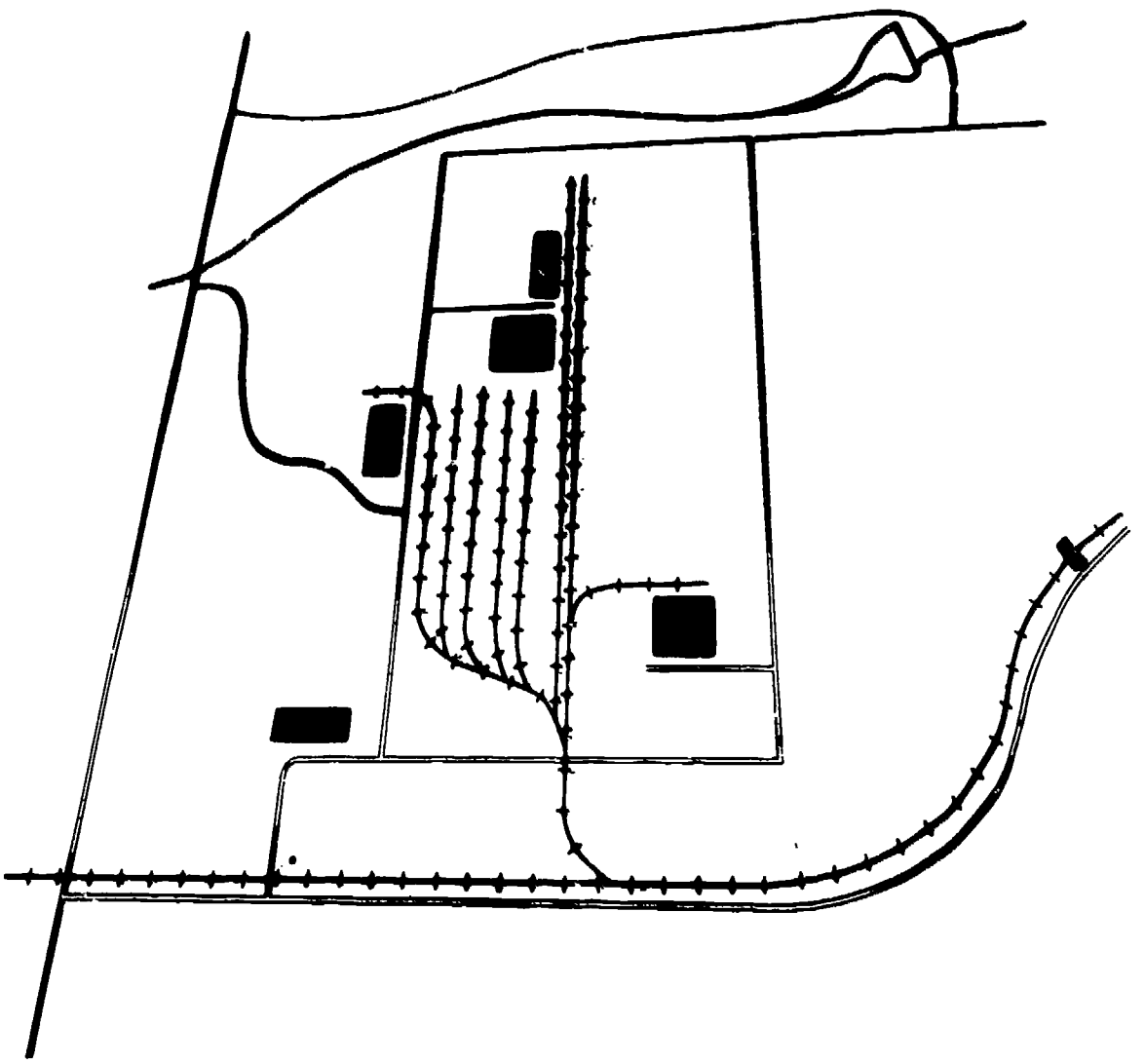


Exhibit B-3

Plate A



B



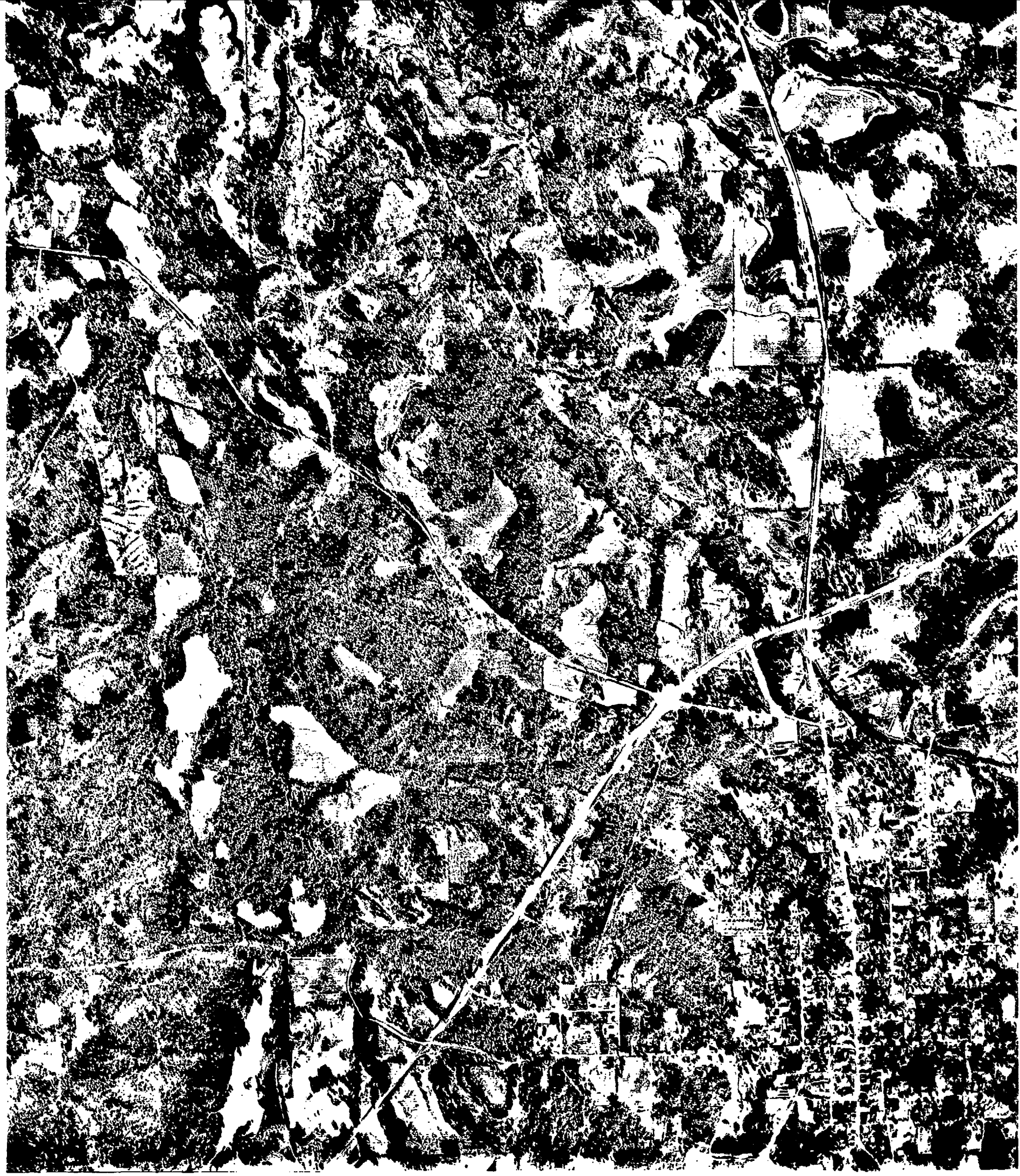


Exhibit B-4

Plate 35 - First of three overlapping aerial photographs

Exhibit B-4

Plate 36 · Second of three overlapping aerial photographs, and one from which technicians were instructed to compile planimetric detail

Exhibit R-4

Plate 37 - Third of three overlapping aerial photographs

Appendix C

Personal History Questionnaires

Exhibit C-1

PERSONAL HISTORY QUESTIONNAIRE

For a study of job success in the cartographic technician field, we need to know about the backgrounds of persons in that field. Your assistance in completing this questionnaire will give us this important information.

When filling out this questionnaire, please remember these points:

(1) This is a research study. Your answers will be treated confidentially. No information related to you as an individual will be given to anyone at your installation or to anyone else in government.

(2) Please answer the questions carefully and completely. You may leave out any particular question if you wish, but we hope you will answer every question.

(3) Notice that for most questions you are to mark only one answer.

Thank you for your cooperation.

Research Staff
Educational Testing Service
Princeton, New Jersey

1. In what agency and what installation do you work?

	Check one
1. Army Map Service, Washington, D.C.	1. ☐
2. Army Map Service, Providence, Rhode Island	2. ☐
3. Army Map Service, Louisville, Kentucky	3. ☐
4. Army Map Service, Kansas City, Missouri	4. ☐
5. Army Map Service, San Antonio, Texas	5. ☐
6. Coast and Geodetic Survey, Rockville-Silver Spring, Maryland	6. ☐
7. Coast and Geodetic Survey, Norfolk, Virginia	7. ☐
8. Bureau of the Census, Jeffersonville, Indiana	8. ☐
9. Army Corps of Engineers, Lake Survey, Detroit, Michigan	9. ☐
10. Army Corps of Engineers, Tulsa, Oklahoma	10. ☐
11. Army Corps of Engineers, New Orleans, Louisiana	11. ☐
12. Army Corps of Engineers, Vicksburg, Mississippi	12. ☐
13. Other (please specify agency and installation) _____	13. ☐

2. What is your occupation?

	Check one
1. Cartographic Technician or Aid (1371)	1. ☐
2. Other (please specify) _____	2. ☐

If you checked "other," do not complete the remainder of this questionnaire but be sure to mail back the questionnaire.

3. Within the past year, have you been reclassified from a Wage Board to a GS classification system?

	Check one
1. No	1. ☐
2. Yes (Please specify the title of the last Wage Board position you held) _____	2. ☐

4. At what grade level did you enter the cartographic technician field (1371)?

Circle one

GS-1
GS-2
GS-3
GS-4
GS-5
GS-6
GS-7
GS-8
GS-9
GS-10
GS-11

5. What is your present grade?

Circle one

GS-2
GS-3
GS-4
GS-5
GS-6
GS-7
GS-8
GS-9
GS-10
GS-11
GS-12
GS-13

6. What is your age?

Check one

1. Less than 20 years ☐ 1.
2. 20 to 29 years ☐ 2.
3. 30 to 39 years ☐ 3.
4. 40 to 49 years ☐ 4.
5. 50 to 59 years ☐ 7.
6. 60 years or older ☐ 6.

7. What is your sex?

Check one

1. Male ☐ 1.
2. Female ☐ 2.

8. Where did you receive most of your training in the cartographic technician field before entering the 1371 cartographic technician or aid series?

	Check one
1. Junior college	1. ☐
2. Four-year college	2. ☐
3. Technical or vocational institute (including correspondence courses)	3. ☐
4. Military training	4. ☐
5. On the job training	5. ☐
6. No prior training	6. ☐
7. Other (please specify) _____	7. ☐

_____

9. Where did you receive your training in the cartographic technician field after entering the 1371 cartographic technician or aid series?

	Check as many as apply
1. Junior college	1. ☐
2. Four-year college	2. ☐
3. Technical or vocational institute (including correspondence courses)	3. ☐
4. Formal pre-assignment training program at a government mapping agency	4. ☐
5. On the job training	5. ☐
6. No further training	6. ☐
7. Other (please specify) _____	7. ☐

_____

10. What is the highest level of education you have reached?

	Check one
1. Eighth grade or less	1. ☐
2. Attended high school but did not graduate	2. ☐
3. Graduated from high school	3. ☐
4. After high school, attended technical or vocational institute less than 2 full-time years, or the equivalent	4. ☐

	Check one
5. After high school, attended post high school technical or vocational institute at least 2 full-time years, or the equivalent	5. ☐
6. Attended college less than 2 full time years or the equivalent	6. ☐
7. Attended college at least 2 full-time years or the equivalent, but did not graduate	7. ☐
8. Graduated from a 4-year college with a B.A., B.S. or other bachelor's degree	8. ☐

11. Which of the following best describe the areas in which you spend the most time and the second most time?

	Most time Check one	Second most time Check one
1. Receiving, storage and shipping	1. ☐	☐
2. Collection and maintenance of source and reference material	2. ☐	☐
3. Drafting, manual compilation, or map revision	3. ☐	☐
4. Stereo, photogrammetric or analogical compilation	4. ☐	☐
5. Automated compilation	5. ☐	☐
6. Three-dimensional terrain relief models	6. ☐	☐
7. Analytical triangulation	7. ☐	☐
8. Analogical triangulation	8. ☐	☐
9. Field work	9. ☐	☐
10. Quality control	10. ☐	☐
11. Editing or reviewing	11. ☐	☐

12. How much total experience have you had as a cartographic technician or cartographic aid?

Check one

1. 2 years or less ☐ 1.
2. 3 to 4 years ☐ 2.
3. 5 to 8 years ☐ 3.
4. 9 to 12 years ☐ 4.
5. 13 to 16 years ☐ 5.
6. 17 to 20 years ☐ 6.
7. More than 20 years ☐ 7.

13. What kind of test were you required to take when you were hired or reclassified as a cartographic technician or aid?

Check as many as apply

1. None ☐ 1.
2. Stereoscopic vision ☐ 2.
3. Civil Service test for Technical Aids in Science and Engineering ☐ 3.
4. Drafting ☐ 4.
5. Other (please specify) _____ ☐ 5.

_____

14. What is the highest level of mathematics you are required to use?

Check one

1. Basic (addition, subtraction, multiplication, division, etc.) ☐ 1.
2. Intermediate (calculations involving fractions, decimals and percentages) ☐ 2.
3. Advanced (algebra, geometry, and statistics) ☐ 3.
4. Very advanced (advanced mathematics or statistics, e.g., calculus, topology, vector analysis, factor analysis, probability theory, etc.) ☐ 4.

ANSWER QUESTIONS 15 THROUGH 18 WITH RESPECT TO THE MAPS YOU MOST FREQUENTLY WORK WITH

15. The maps you work with are primarily — Check one

1. Maps of domestic areas ☐ 1.
2. Maps of foreign areas ☐ 2.
3. Maps of extra-terrestrial areas ☐ 3.

16. The maps you work with are primarily — Check one

1. Topographical maps ☐ 1.
2. Planimetric maps ☐ 2.
3. Hydrographic maps ☐ 3.
4. Aeronautical charts ☐ 4.
5. 3-dimensional relief models ☐ 5.
6. Pictomaps ☐ 6.
7. Other special purpose maps (plese specify)_____ ☐ 7.

_____

17. The maps you work with are primarily — Check one

1. New Maps ☐ 1.
2. Revisions of previous maps ☐ 2.

18. The maps you work with are primarily — Check one

1. Small scale maps ☐ 1.
2. Medium scale maps ☐ 2.
3. Large scale maps ☐ 3.
4. Maps of all scales ☐ 4.
5. Other (please describe)_____ ☐ 5.

_____

The rest of the questionnaire consists of a list of tasks cartographic technicians and aids perform. For each task in the list, please check the box which best shows how often you performed the task during the past year. If, during the year, you have rotated or been transferred from one area to another, check the frequency which describes how often you have performed each task when assigned to the area where it is more frequently done.

		Check one box for each task			
		Often	Some-times	Seldom	Never
1. Drafting or compiling with a pen and plastic ink	1.	☐	☐	☐	☐
2. Drafting or compiling with a pencil	2.	☐	☐	☐	☐
3. Draft or compile logical contour lines	3.	☐	☐	☐	☐
4. Draft or compile air facilities or boundary lines	4.	☐	☐	☐	☐
5. Construct map projections using a UTM (Universal Transverse Mercator) or other grid system	5.	☐	☐	☐	☐
6. Plot geographic and grid coordinates	6.	☐	☐	☐	☐
7. "Pull-up" or enlarge detail from a small scale map to a medium or large scale	7.	☐	☐	☐	☐
8. Reduce detail from a large or medium scale map to a medium or small scale map	8.	☐	☐	☐	☐
9. Use UTM or other grid coordinate table to determine grid coordinates	9.	☐	☐	☐	☐
10. Prepare one or more overlays such as vegetation, open-water guide, culture	10.	☐	☐	☐	☐
11. Plot and draft grid coordinate points on master grid	11.	☐	☐	☐	☐
12. Plot base control points on plot sheets	12.	☐	☐	☐	☐
13. Indicate detail such as drainage patterns by shading with an air brush	13.	☐	☐	☐	☐
14. Do vignetting by hand	14.	☐	☐	☐	☐
15. Do vignetting with mechanical equipment	15.	☐	☐	☐	☐
16. Determine which information to include or exclude on a map using information from a list or report	16.	☐	☐	☐	☐

		Check one box for each task			
		Often	Some-times	Seldom	Never
17.	Determine which of 2 or more sources of information is more correct according to specifications provided	17. ☐	☐	☐	☐
18.	Maintain equipment by doing such things as oiling parts or replacing fuses	18. ☐	☐	☐	☐
19.	Transferring data to common scales	19. ☐	☐	☐	☐
20.	"Stick-up;" prepare a type overlay from a hand-lettered names overlay using adhesive, machine composed type	20. ☐	☐	☐	☐
21.	Do hand-lettering	21. ☐	☐	☐	☐
22.	Select and generalize detail which will be drafted and finalized on an overlay	22. ☐	☐	☐	☐
23.	Draft and finalize detail on an overlay	23. ☐	☐	☐	☐
24.	Photo mosaic; cut, position and glue photographs to fit base map or plotted control points	24. ☐	☐	☐	☐
25.	Panelling; cut, position and glue source material to fit base map or plotted control points	25. ☐	☐	☐	☐
26.	Select, position and ink names on a names overlay	26. ☐	☐	☐	☐
27.	Match or check map or overlay with those of adjoining map sheets for agreement of placement of detail such as roads and contour lines	27. ☐	☐	☐	☐
28.	Make corrections indicated by supervisor, editor, reviewer, or group leader	28. ☐	☐	☐	☐
29.	Use a pantograph, or similar instrument to copy a map in larger or smaller scale	29. ☐	☐	☐	☐
30.	Use a reflecting projector to copy a map in larger or smaller scale	30. ☐	☐	☐	☐
31.	Classify roads from source materials or photographs	31. ☐	☐	☐	☐
32.	Compile or draft border data	32. ☐	☐	☐	☐
33.	Compile, or draft foreshore and offshore hydrographic features such as fathom lines, shorelines, reefs, mud flats, shoals, etc.	33. ☐	☐	☐	☐

		Check one box for each task			
		Often	Some-times	Seldom	Never
34.	Use reference materials such as atlases and maps to secure place names and other information.	34. ☐	☐	☐	☐
35.	Use reference tables or guides to determine meaning of foreign or domestic symbols	35. ☐	☐	☐	☐
36.	Use style sheets or guides to look up correct type styles or sizes	36. ☐	☐	☐	☐
37.	Check source map against field reports	37. ☐	☐	☐	☐
38.	Photo index; plot location of photo-graphs onto an overlay by comparing detail on the photographs with detail on the base map or on the film positives of the base map	38. ☐	☐	☐	☐
39.	Scribe contour lines or other detail on scribe-coated plastic sheets	39. ☐	☐	☐	☐
40.	Color separation of map symbols and features	40. ☐	☐	☐	☐
41.	Plotting and negative engraving of atlas or other grids	41. ☐	☐	☐	☐
42.	Opaque such things as pin holes, scratches and road intersections on negatives	42. ☐	☐	☐	☐
43.	Determine the number of color plates needed to produce the finished map	43. ☐	☐	☐	☐
44.	Position registry ticks on scribe sheets	44. ☐	☐	☐	☐
45.	Plan and draft visual presentations of data such as bar scales or charts	45. ☐	☐	☐	☐
46.	Gather data such as population statistics or aeronautical obstructions from other divisions within your agency or another governmental agency	46. ☐	☐	☐	☐
47.	Maintain master or standard maps by continuously compiling and indicating revisions or changes on master or reference map (e.g. a base standard map) of a specific area for which you are responsible	47. ☐	☐	☐	☐
48.	Revise master or reference map	48. ☐	☐	☐	☐
49.	Determine what source materials will be needed for a map	49. ☐	☐	☐	☐

		Check one box for each task			
		Often	Some-times	Seldom	Never
50.	Maintain production records	50. ☐	☐	☐	☐
51.	Order necessary film positives or negatives	51. ☐	☐	☐	☐
52.	Compile a jacket request	52. ☐	☐	☐	☐
53.	Prepare a slotted template	53. ☐	☐	☐	☐
54.	Assemble materials and equipment for shipment	54. ☐	☐	☐	☐
55.	Prepare materials and equipment for shipment	55. ☐	☐	☐	☐
56.	Record on a docket or storage record the materials or equipment to be stored	56. ☐	☐	☐	☐
57.	Prepare equipment and materials for storage	57. ☐	☐	☐	☐
58.	Route incoming materials to appropriate person or department within the installation	58. ☐	☐	☐	☐
59.	Record or list incoming materials on docket or receiving list	59. ☐	☐	☐	☐
60.	Complete shipment forms for out-going materials and equipment	60. ☐	☐	☐	☐
61.	Determine where to route incoming materials	61. ☐	☐	☐	☐
62.	Analyze information received on a teletype other than one serving as a remote computer terminal	62. ☐	☐	☐	☐
63.	Use a magnifying glass	63. ☐	☐	☐	☐
64.	Use anaglyphic (stereoscopic) glasses	64. ☐	☐	☐	☐
65.	Determine what detail on a black and white--one color-map to color and color detail using colored pencils	65. ☐	☐	☐	☐
66.	Make rough preliminary sketches of map or chart detail	66. ☐	☐	☐	☐
67.	Fill out standard forms or reports	67. ☐	☐	☐	☐
68.	Use stereoscope, stereogram or other small stereoscopic instruments	68. ☐	☐	☐	☐

		Check one box for each task			
		Often	Some-times	Seldom	Never
69.	Use large non-automated stereoplotting equipment	69. ☐	☐	☐	☐
70.	Use semi-automated stereoplotting equipment	70. ☐	☐	☐	☐
71.	Make stereoscopic comparisons of features on aerial photographs with those on existing maps	71. ☐	☐	☐	☐
72.	Photo revise; add, delete or revise detail on film positive of source map using plastic ink	72. ☐	☐	☐	☐
73.	Photo interpretation of aerial photographs; extracting information from aerial photographs	73. ☐	☐	☐	☐
74.	Determine elevations from aerial photographs or other source materials	74. ☐	☐	☐	☐
75.	Restitution of aerial photographs	75. ☐	☐	☐	☐
76.	Use reference tables to make geometric conversions or other mathematical calculations	76. ☐	☐	☐	☐
77.	Use desk calculator for mathematical computations	77. ☐	☐	☐	☐
78.	Use compass, protractor or triangle	78. ☐	☐	☐	☐
79.	Operate stereo comparator	79. ☐	☐	☐	☐
80.	Operate mono comparator	80. ☐	☐	☐	☐
81.	Use slide rule	81. ☐	☐	☐	☐
82.	Compute angles and distances from survey data	82. ☐	☐	☐	☐
83.	Select control points	83. ☐	☐	☐	☐
84.	Determine distances from SHORAN or LORAN data	84. ☐	☐	☐	☐
85.	Extend grid control using radial-line plotting	85. ☐	☐	☐	☐
86.	Operate non-automated milling machines to carve three-dimensional models	86. ☐	☐	☐	☐
87.	Operate automated machines to carve three-dimensional models	87. ☐	☐	☐	☐

			Check one box for each task			
			Often	Some-times	Seldom	Never
88.	Carve finishing detail on models cast in plaster	88.	☐	☐	☐	☐
89.	Photograph manuscripts, scribe sheets or overlays	89.	☐	☐	☐	☐
90.	Make-up flight plans for aerial photography	90.	☐	☐	☐	☐
91.	Supervise other personnel	91.	☐	☐	☐	☐
92.	Teach some aspect of mapping as part of on the job training of lower grade personnel	92.	☐	☐	☐	☐
93.	Teach some aspect of mapping as part of a formal pre-assignment training course	93.	☐	☐	☐	☐
94.	Enlarge or reduce aerial photographs using photographic equipment	94.	☐	☐	☐	☐
95.	Test cameras used for aerial photography for conformity with calibration information supplied	95.	☐	☐	☐	☐
96.	Review overlays for errors	96.	☐	☐	☐	☐
97.	Review scribe sheets for errors	97.	☐	☐	☐	☐
98.	Review working manuscripts for errors	98.	☐	☐	☐	☐
99.	Review final composite for errors	99.	☐	☐	☐	☐
100.	Indicate corrections to be made by another person	100.	☐	☐	☐	☐
101.	Photo inspection in the field	101.	☐	☐	☐	☐
102.	Field classification of culture, terrain or planimetric features	102.	☐	☐	☐	☐
103.	Ratio photographs for rectification	103.	☐	☐	☐	☐
104.	Key punch "IBM" punch cards	104.	☐	☐	☐	☐
105.	Check punched cards for keypunching errors	105.	☐	☐	☐	☐
106.	Read information or data on computer printout	106.	☐	☐	☐	☐
107.	Analyze data processed by a computer	107.	☐	☐	☐	☐
108.	Put punched data cards in correct sequence	108.	☐	☐	☐	☐
109.	Select appropriate prepunched program cards	109.	☐	☐	☐	☐

			Check one box for each task			
			Often	Sometimes	Seldom	Never
110.	Select appropriate existing computer program	110.	☐	☐	☐	☐
111.	Insert prepunched program cards in deck of punched data cards in appropriate places	111.	☐	☐	☐	☐
112.	Write computer programs in a symbolic language	112.	☐	☐	☐	☐
113.	Write computer programs in a machine language	113.	☐	☐	☐	☐
114.	Revise computer programs to correct mistakes in the programs	114.	☐	☐	☐	☐
115.	Modify computer programs to meet new requirements or demands	115.	☐	☐	☐	☐
116.	Operate automated mapping equipment	116.	☐	☐	☐	☐
117.	Operate off-line equipment such as card printers, card readers, card sorters or card interpreters	117.	☐	☐	☐	☐
118.	Act as a consultant or advisor on some aspect of cartography but not in own installation	118.	☐	☐	☐	☐
119.	Plan and schedule own work on assigned projects	119.	☐	☐	☐	☐
120.	Keep informed of revisions in map specifications	120.	☐	☐	☐	☐
121.	Estimate costs of projects	121.	☐	☐	☐	☐
122.	Estimate man hours required on a project	122.	☐	☐	☐	☐
123.	Attend training programs at equipment manufacturing companies	123.	☐	☐	☐	☐
124.	Attend training programs at own installation on operation or use of new automated or semiautomated equipment	124.	☐	☐	☐	☐
125.	Attend training program at another installation (of own or of another agency) on operation or use of new automated or semiautomated equipment	125.	☐	☐	☐	☐
126.	Attend other types of training programs not at own installation	126.	☐	☐	☐	☐
127.	Write instructions to lower grade employees about projects they will be working on	127.	☐	☐	☐	☐
128.	Estimate number of man hours other employees will need to complete a project	128.	☐	☐	☐	☐

		Often	Some-times	Seldom	Never
129. Coordinate internal and external work done on a mapping project	129.	☐	☐	☐	☐
130. Establish policy for mapping done on a specific geographic area	130.	☐	☐	☐	☐

If there are tasks which you perform regularly which are not included in this list, please list and describe them below.

131. _____

_____

132. _____

_____

133. _____

_____

134. _____

_____

135. _____

_____

136. _____

_____

137. _____

_____

138. _____

_____

139. _____

_____

140. _____

_____

PR-71-22

Appendix C

Exhibit C-2

PERSONAL HISTORY QUESTIONNAIRE

Prepared by
EDUCATIONAL TESTING SERVICE

(Experimental edition - for research purposes only)

PERSONAL HISTORY QUESTIONNAIRE

For a study of job success in the cartographic technician field, we need to know about the backgrounds of persons in that field. Your assistance in completing this questionnaire will give us this important information.

This is a research study, and your answers will be treated confidentially. No information about you as an individual will be given to anyone at your installation or to anyone else in government.

On the following pages you will find a number of questions concerning your personal background. Please try to answer them as accurately and completely as you are able. There are no "right" or "wrong" answers. You may leave out any particular question if you wish, but we hope you will answer every question.

In most cases, you are to record your answers by making check marks in the squares on the right-hand side of each page. Please mark only one answer for each question unless you are instructed otherwise.

For some of the questions, you are asked to write the information requested in the blank spaces provided. Please read each question carefully, so that you will know what you are expected to do.

Remember, your responses will be kept strictly confidential.

Thank you for your cooperation.

Research Staff
Educational Testing Service
Princeton, N.J. 08540

A. GENERAL BACKGROUND

1. What is your age?

	Check one
1. Less than 20 years	1. ☐
2. 20 to 29 years	2. ☐
3. 30 to 39 years	3. ☐
4. 40 to 49 years	4. ☐
5. 50 to 59 years	5. ☐
6. 60 years or older	6. ☐

2. What is your sex?

	Check one
1. Male	1. ☐
2. Female	2. ☐

3-4. Please indicate the highest level of education completed by your parents or guardians.

	3. Father's education Check one	4. Mother's education Check one
1. 8th grade, or less	1. ☐	1. ☐
2. 9th or 10th grade	2. ☐	2. ☐
3. 11th or 12th grade	3. ☐	3. ☐
4. 1 or 2 years of college or other training beyond high school	4. ☐	4. ☐
5. 3 or 4 years of college	5. ☐	5. ☐
6. 1 year or more of graduate school	6. ☐	6. ☐

5. Which one of the following comes closest to describing your father's main occupation while you were growing up?

	Check one
1. Unskilled worker, or laborer (farm work, fisherman, filling station attendant)	1. ☐
2. Semiskilled worker (machine operator, bus driver, meat cutter)	2. ☐
3. Service worker (policeman, fireman, barber, military noncommissioned officer)	3. ☐
4. Skilled worker or craftsman (carpenter, electrician, plumber)	4. ☐
5. Sales or clerical worker (insurance salesman, bookkeeper, secretary, office worker, bank teller, mail carrier)	5. ☐
6. Owner, manager or partner of a small business; lower level governmental official; military commissioned officer	6. ☐
7. Profession requiring a bachelor's degree (engineer, elementary or secondary school teacher)	7. ☐
8. Owner or high-level executive of a large business, or high-level government official	8. ☐
9. Profession requiring an advanced college degree, or proficiency in the arts (doctor, lawyer, college professor, actor, artist, writer)	9. ☐

6. Which one of the following comes closest to describing your mother's main occupation while you were growing up?

		Check one
01.	Housewife -- she did not work steadily outside the home.	01. ☐
02.	Unskilled worker or laborer (laundry worker, farm worker)	02. ☐
03.	Semiskilled worker (machine operator, wrapper, assembler)	03. ☐
04.	Service worker (beautician, waitress)	04. ☐
05.	Skilled worker or craftsman (baker, inspector)	05. ☐
06.	Sales or clerical worker (insurance saleswoman, bookkeeper, secretary, bank teller, office worker; practical nurse)	06. ☐
07.	Owner, manager or partner of a small business; lower level governmental official; military commissioned officer; registered nurse	07. ☐
08.	Profession requiring a bachelor's degree (social worker, elementary or secondary teacher)	08. ☐
09.	Owner or high-level executive of a large business or high-level governmental agency	09. ☐
10.	Profession requiring an advanced college degree (doctor, lawyer, college professor, etc.)	10. ☐

7. While you were growing up, was a language other than English spoken in your home?

	Check one
1. Yes	1. ☐
2. No	2. ☐

(If your answer is "No," skip questions 8-13 and go on to Section B, question 14.)

* * * * * * * * * * *

8-13. (To be answered only if you answered "yes" to question 7.)

8. Other than English, what was the language spoken most often in your home?

	Check one
1. Mexican Spanish	1. ☐
2. Puerto Rican Spanish	2. ☐
3. Cuban Spanish	3. ☐
4. Other Spanish (Specify: _____)	4. ☐
5. Italian	5. ☐
6. French	6. ☐
7. Other (Specify: _____)	7. ☐

9. How much was that language spoken in your home?

	Check one
1. Very little	1. ☐
2. About 1/4 of the time	2. ☐
3. About 1/2 of the time	3. ☐
4. About 3/4 of the time	4. ☐
5. Almost all the time	5. ☐

10. How easily can you <u>read and understand</u> a newspaper in that language?

	Check one
1. With much difficulty	1. ☐
2. With some difficulty, but can get by	2. ☐
3. With no difficulty at all	3. ☐

11. How easily can you <u>carry on a conversation</u> in that language?

	Check one
1. With much difficulty	1. ☐
2. With some difficulty, but can get by	2. ☐
3. With no difficulty at all	3. ☐

12. How does your <u>reading</u> knowledge of that language compare with your knowledge of English?

	Check one
1. Read that language better	1. ☐
2. About the same	2. ☐
3. Read English better	3. ☐

13. How does your <u>speaking</u> knowledge of that language compare with your knowledge of English?

	Check one
1. Speak that language better	1. ☐
2. About the same	2. ☐
3. Speak English better	3. ☐

B. EDUCATION AND TRAINING

14. What is the highest level of education you have completed?

	Check one
1. 8th grade, or less	1. ☐
2. 9th or 10th grade	2. ☐
3. 11th or 12th grade or received High School Equivalency Diploma (GED)	3. ☐
4. After grade 12, 1 or 2 years at a technical or vocational institute, or the equivalent	4. ☐
5. 1 or 2 years of college	5. ☐
6. 3 or 4 years of college	6. ☐
7. 1 year or more of graduate school	7. ☐

15. What was your major area of study in high school?

	Check one
1. Academic or college preparatory	1. ☐
2. General	2. ☐
3. Business or commercial	3. ☐
4. Home economics	4. ☐
5. Commercial art	5. ☐
6. Mechanical drawing or drafting	6. ☐
7. Cartography	7. ☐
8. Vocational or industrial arts <u>other</u> <u>than</u> the 3 above (5, 6 and 7)	8. ☐

16. What was your approximate standing in your high school graduating class?

	Check one
1. In the top 1/4	1. ☐
2. In the second 1/4	2. ☐
3. In the third 1/4	3. ☐
4. In the bottom 1/4	4. ☐
5. Did not graduate	5. ☐

17. What type of high school did you attend most?

	Check one
1. Public	1. ☐
2. Parochial	2. ☐
3. Independent	3. ☐

18. Where did you receive your high school (or equivalent) education?

	Check one
1. United States	1. ☐
2. Mexico	2. ☐
3. Puerto Rico	3. ☐
4. Cuba	4. ☐
5. Canada	5. ☐
6. Other country (Specify: _____)	6. ☐

19. How much <u>formal</u> training in the cartographic technician field did you receive <u>before</u> entering the 1371 series?

	Check one
1. <u>None, or hardly any</u>: less than 4 credits in a high school, college or technical school, and less than one month of other instruction (such as classes in the military, or at a commercial or governmental map-making organization).	1. ☐
2. <u>A moderate amount</u>: 4 to 11 credits in a high school, college or technical school, or 2 to 6 months of other instruction.	2. ☐
3. <u>Quite a lot</u>: 12 or more credits in a high school, college or technical school, or more than 6 months of other instruction.	3. ☐

20. Where was most of this training received?

	Check one
1. High school	1. ☐
2. Junior or 4-year college	2. ☐
3. Technical or vocational institute (including correspondence courses)	3. ☐
4. In the Military	4. ☐
5. At a civilian governmental mapping organization	5. ☐
6. At a commercial mapping organization	6. ☐
7. Other location	7. ☐
8. No prior formal training	8. ☐

21. Where did you receive most of your <u>on-the-job</u> training in the cartographic technician field, <u>before</u> entering the 1371 job series?

	Check one
1. At a technical or vocational institute (work-study program)	1. ☐
2. In the Military	2. ☐
3. At a commercial map-making organization	3. ☐
4. At a governmental map-making organization	4. ☐
5. Other	5. ☐
6. No prior on-the-job training	6. ☐

22. How many college-level credits have you earned in subjects related to cartography, <u>after</u> entering the 1371 job series?

	Check one
1. None	1. ☐
2. 1-3	2. ☐
3. 4-6	3. ☐
4. 7-9	4. ☐
5. 10 or more	5. ☐

23. Since entering the 1371 series, how many months of training have you received for your job? Include any periods of training in a classroom setting such as a training center, whether at your job location or elsewhere.

	Check one
1. Less than 1 month	1. ☐
2. 1 or 2 months	2. ☐
3. 3 or 4 months	3. ☐
4. 5 or 6 months	4. ☐
5. 7 or 8 months	5. ☐
6. More than 8 months	6. ☐

24. What kind of test were you required to take when you were hired or reclassified as a cartographic technician or aid?

	Check as many as apply
1. None	1. ☐
2. Stereoscopic vision	2. ☐
3. Civil Service test for Technical Aids in Science and Engineering	3. ☐
4. Drafting	4. ☐
5. Other (please specify) _____	5. ☐

25. What is the highest level of mathematics you are required to use?

	Check one
1. Basic (addition, subtraction, multiplication, division, etc.)	1. ☐
2. Intermediate (calculations involving fractions, decimals and percentages)	2. ☐
3. Advanced (algebra, geometry, and statistics)	3. ☐
4. Very advanced (advanced mathematics or statistics, e.g., calculus, topology, vector analysis, factor analysis, probability theory, etc.)	4. ☐

C. EXPERIENCE AND WORK HISTORY

26-27. Why did you choose a career in cartography?

		26. Main Reason Check one	27. Second Reason Check one
01.	General interest in the cartographic field	01. ☐	01. ☐
02.	Influence of friends or relatives	02. ☐	02. ☐
03.	Influence of counselors	03. ☐	03. ☐
04.	Influence of recruiters	04. ☐	04. ☐
05.	Expected income	05. ☐	05. ☐
06.	Job availability	06. ☐	06. ☐
07.	Job security	07. ☐	07. ☐
08.	Training opportunities--in military schools, through scholarships, apprenticeships, etc.	08. ☐	08. ☐
09.	Desire to serve the country	09. ☐	09. ☐
10.	"Just fell into it"	10. ☐	10. ☐
11.	Other (specify: _____)	11. ☐	11. ☐

28. Were you reclassified from Wage Board to the GS 1371 Series?

		Check one
1.	No	1. ☐
2.	Yes, within the last 6 months	2. ☐
3.	Yes, within the last 7-12 months	3. ☐
4.	Yes, over a year ago	4. ☐

29. At what grade level did you enter the cartographic technician field (1371)?

Circle one
GS-1
GS-2
GS-3
GS-4
GS-5
GS-6
GS-7
GS-8
GS-9
GS-10
GS-11

30. What is your present grade?

Circle one
GS-1
GS-2
GS-3
GS-4
GS-5
GS-6
GS-7
GS-8
GS-9
GS-10
GS-11
GS-12
GS-13

31-35. How many years have you worked as a cartographic aid or technician (1371), at the GS levels indicated?

(Circle the correct number of years, for every question. If you have not worked at an indicated level, circle zero.)

		Number of Years											
31.	GS 1-3	0	1	2	3	4	5	6	7	8	9	10	11 or more
32.	GS 4-5	0	1	2	3	4	5	6	7	8	9	10	11 or more
33.	GS 6-7	0	1	2	3	4	5	6	7	8	9	10	11 or more
34.	GS 8-9	0	1	2	3	4	5	6	7	8	9	10	11 or more
35.	GS 10 or higher	0	1	2	3	4	5	6	7	8	9	10	11 or more

36. What is the total number of years you have worked as a cartographic aid or technician in the 1371 series?

	Check one
1. Less than 2 years	1. ☐
2. 2-3 years	2. ☐
3. 4-7 years	3. ☐
4. 8-11 years	4. ☐
5. 12-15 years	5. ☐
6. 16-19 years	6. ☐
7. 20 years or longer	7. ☐

37. What is the <u>total</u> number of years you have done the work of a cartographic aid or technician, but <u>not</u> in the 1371 series?

	Check one
1. Less than 2 years	1. ☐
2. 2-3 years	2. ☐
3. 4-7 years	3. ☐
4. 8-11 years	4. ☐
5. 12-15 years	5. ☐
6. 16-19 years	6. ☐
7. 20 years or longer	7. ☐

38. How long have you been employed at the mapping installation where you now work?

	Check one
1. Less than 6 months	1. ☐
2. 6-11 months	2. ☐
3. 1-3 years	3. ☐
4. 4-7 years	4. ☐
5. 8 years or longer	5. ☐

39. How many years have you spent in federal civil service <u>other than</u> 1371?

	Check one
1. Less than 2 years (including none)	1. ☐
2. 2-3 years	2. ☐
3. 4-7 years	3. ☐
4. 8-11 years	4. ☐
5. 12-15 years	5. ☐
6. 16-19 years	6. ☐
7. 20 years or longer	7. ☐

40. How long were you on active duty in the armed forces?

	Check one
1. Have never been in the armed forces	1. ☐
2. Less than 1 year	2. ☐
3. 1-3 years	3. ☐
4. 4-7 years	4. ☐
5. 8 years or longer	5. ☐

41. Which of the following do you feel is the <u>one</u> <u>most</u> important thing about your job?

	Check one
01. Starting salary	01. ☐
02. Future salary	02. ☐
03. Job security	03. ☐
04. Good supervisors	04. ☐
05. Good fellow workers	05. ☐
06. Working conditions	06. ☐
07. Opportunity for promotion	07. ☐
08. Good fringe benefits	08. ☐
09. Serving others	09. ☐
10. Serving the country	10. ☐
11. Interesting work	11. ☐
12. Prestige in the community	12. ☐

42-43. Which of the following best describe the areas in which you spend the most time and the second most time?

		42. Most time	43. Second most time
		Check one	Check one
01.	Collection and maintenance of source and reference material	01. ☐	01. ☐
02.	Drafting, manual compilation, or map revision	02. ☐	02. ☐
03.	Stereo, photogrammetric or analogical compilation	03. ☐	03. ☐
04.	Automated compilation	04. ☐	04. ☐
05.	Three-dimensional terrain relief models	05. ☐	05. ☐
06.	Analytical triangulation	06. ☐	06. ☐
07.	Analogical triangulation	07. ☐	07. ☐
08.	Field work	08. ☐	08. ☐
09.	Quality control, editing or reviewing	09. ☐	09. ☐
10.	Pictomapping	10. ☐	10. ☐
11.	Photomosaics	11. ☐	11. ☐
12.	Shaded relief	12. ☐	12. ☐
13.	Other	13. ☐	13. ☐

ANSWER QUESTIONS 44 THROUGH 47 WITH RESPECT TO HOW YOUR WORKING TIME IS SPENT. CONSIDER ALL THE TIME YOU SPEND AT WORK AS BEING 100%. FOR THE FOLLOWING FOUR QUESTIONS, PLEASE PUT THE PERCENT OF YOUR TOTAL WORKING TIME SPENT ON EACH TYPE OF MAP IN THE BOXES ON THE RIGHT. IF YOU DO NOT SPEND ANY TIME IN A PARTICULAR AREA WRITE "0" IN THE BOX FOR THAT CATEGORY.

44. The areas of mapping you spend time on are

	Percent of time in each area
1. Domestic	1. ☐
2. Foreign	2. ☐
3. Extra-terrestrial	3. ☐
TOTAL	100%

45. The types of maps you spend time on are

	Percent of time working with each type
1. Topographic	1. ☐
2. Planimetric	2. ☐
3. Hydrographic	3. ☐
4. Aeronautical charts	4. ☐
5. 3-dimensional relief models	5. ☐
6. Pictomaps	6. ☐
7. Other special purpose maps	7. ☐
TOTAL	100%

46. The types of maps you spend time on are

	Percent of time working with each type
1. New maps	1. ☐
2. Revisions of previous maps	2. ☐
	TOTAL 100%

47. The scales of maps you spend time on are

	Percent of time working with each scale
1. Small scale	1. ☐
2. Medium scale	2. ☐
3. Large scale	3. ☐
4. Other	4. ☐
	TOTAL 100%