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PROCEEDINGS OF 19. DIVISION MILITARY PSYCHOLOGY SYMPOSIUM: COLLECTING, ANALYZING, AND REPORTING INFORMATION DESCRIBING JOBS AND OCCUPATIONS

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February 1974

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Approved for publication.

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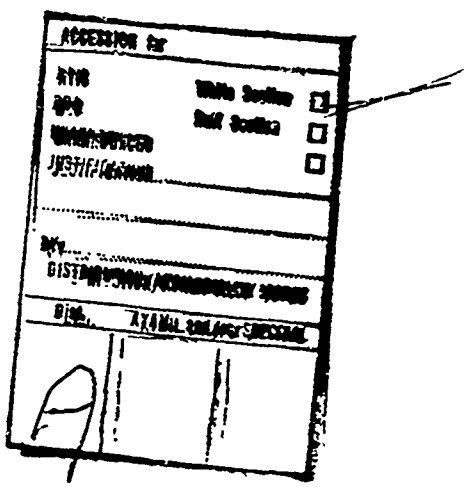

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A symposium was conducted by Division 19, Military Psychology, of the American Psychological Association at the 77th Annual Convention of APA in Washington, D. C., 31 Aug – 4 Sep 69. The four presentations dealt with job analysis in the Canadian Forces, the military occupational data bank and job analysis, job analysis in the US Training and Employment Service (USTESPS), and collecting, analyzing and reporting information describing jobs in the United States Air Force.

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FOREWORD

After years of comparative quiessence with little innovation in job analysis methodology, the last decade has witnessed a tremendous upsurge of activity. The new movement has been largely associated with major government agencies, who have developed procedures for collecting and processing great masses of job data. They are setting up occupational data banks and have devised sophisticated information retrieval systems to satisfy a multitude of operational demands. Since Division 19 offered to sponsor the symposium, this appeared to be an opportune time to have representatives of some of the most active agencies report on their progress.

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JOB ANALYSIS IN THE CANADIAN FORCES PRESENT AND FUTURE

By

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The programme followed in the Canadian Armed Forces owes much to the research conducted by other agencies and activities and, in particular, the task inventory techniques developed by the United States Air Force.

Although there are numerous sources available to draw on for the techniques of analysis, there is not much available on the organizational aspects which are integral to the success of a programme. In this paper attention will be paid to these aspects plus the techniques followed.

How did it begin? There is a tendency in the Forces to date everything from the start of integration but, in the case of occupational analysis, this is not so. Each service had practiced a form of analysis prior to integration. One service had in situ studies while the other two used the technical conference method. This was after all three had experimented with an "open-ended" questionnaire in the early 1950's. The questionnaire was mailed out to the serviceman and then returned fo. analysis and processing. The volume was large and because it was difficult to discriminate between the information contained in one questionnaire against that of another, this programme was dropped.

When the Government's White Paper on Defence was made public in mid-1964, it was apparent that, to meet the goals for integration, an early start had to be made on a common personnel policy, organizational changes, etc. Working groups drawn from all three services were established to formulate the detailed plans to achieve integration and during this period the occupational analysis function of the three services had been fragmented. Because it was necessary to set up a personnel structure, certain analysts were detailed to the newly created Chief of Personnel Branch, while others were sent to the Comptroller General Branch. This was partly the outcome of how the previous separate services had treated their analysis function; one service solely as a part of Personnel, another as an organizational function within its Comptroller activities and the other had analysts in both Personnel and Comptroller. The only common factor was that occupational analysis had been recognized by the separate services as a centralized activity operating out of the old Navy, Army and Air Force Headquarters. This was a distinct advantage when the analysis function was permanently established in the new Force; this will be discussed later in this paper. As can be seen it was obvious that responsibilities, concerning job analysis between the Chief of Personnel and the Comptroller General in the new Force had to be clearly defined to avoid friction and confusion. After mutual discussion and agreement the Comptroller General was given the system development and actual conduct of analysis function and the Chief of Personnel the responsibility to apply obtained data to the new personnel structure.

To digress for a moment, the decisions of the Working Group studying Trade Structure (MOS) had reduced the three services total trades from in excess of 330 to approximately 112 and had drafted Trade Specifications to cover these new trades. Trade Specifications so developed were the first step in establishing training programmes. It was at this time that recognition was given to the need for a validation of the new Trade Specifications arrived at by subjective means by a form of job analysis. While drafting of new Trade Specifications for a common force had been going on, a special group known as the Minister's Manpower Study (Men), chaired by then Commodore, now Vice-Admiral Hennessy, had made a preliminary recommendation that a strong job analysis programme be given priority.

In retrospect it was fortunate that the delineation of responsibilities for job analysis techniques and data application plus a recommendation for a strong formal programme was nearly coincident. With acceptance and support from top level management the Canadian Forces programme was launched. The first task of the Job Analysis Section established within the Comptroller General Branch was to determine from the multitude of techniques available those techniques which could be effectively applied in the Canadian Forces. This began in August 1965 and a thorough study of available literature plus discussions with interested activities, that is, interested from the standpoint of using the information, took place over the next few months.

On conclusion of the study, a report was submitted which recommended what was a departure from the historic approach taken to job analysis pre-1964, in that it was considered that obtained data could be more effectively used if they satisfied the requirements of more than one user. Previously the only application was for trades training purposes. Cognizance was taken of the need to satisfy diverse users who had stated a firm need for the data and also possible and probable future users.

The report was accepted with little change and detailed planning commenced in November 1965. It was decided that a pilot study would be initially undertaken to test the method and correct any faulty procedures before complete committal of expensive manpower resources. The method to be employed in the pilot study was a combination of observation interview, technical conference and questionnaire techniques. Using this approach it was believed that the advantages of any one technique could be maximized and the disadvantages minimized.

The trade selected was a technical trade, Vehicle Technician, a trade with a fair degree of administrative involvement and also one which could be examined within a minimum period of time. This trade represented two of the three former services. Preliminary work was required to be completed prior to dispatching analysts to examine the employment of tradesmen. Consultations were held with personnel staffs within Canadian Forces Headquarters and the Office of Primary Interest; the agency responsible for the employment and policies related to the trade. While this was being done the Commands of the Canadian Forces were briefed on the objectives and methods of the programme. An Administrative Order was also completed and distributed to all involved units and formations outlining the methods to be followed.

In February 1966, all analysts began the study at one major base complex. All analysts were involved because this trade was to be the training ground for the nucleus of the analysts in the section and it was critical that the detailed procedures developed, as the study progressed, were thoroughly understood by every man. Each man knew he would be responsible for taking a new analyst under his wing, after a short training period in the future, if the pilot study was satisfactory. For this reason, and also to observe team cohesion the group, seven in number, travelled and stayed together throughout the study. The keeping of the team together during this period allowed an interchange of ideas among the analysts and this has proven to be invaluable as other trades have been studied. The operating procedures developed owe much to the exchange of views by analysts and units within the field. It was apparent that observation interview of tradesmen at their places of work achieved our purpose to obtain information for subsequent use in a task inventory.

When the observation and interview phase of the representative sample was completed the analysts returned to Canadian Forces Headquarters and constructed a task inventory in conjunction with the Office of Primary Interest. This was necessary because the analysis section did not possess the technical expertise. The inventory so developed was field tested with a small group of vehicle technicians and their suggestions incorporated prior to large scale application. The final inventory was then administered to as nearly 100% of the trade as possible, in this case 80.5% of the trade was covered. Responses were key punched and the results presented in a print out acceptable to the users. It was concluded that the method was satisfactory in terms of quality but it was found that refinements could be made to the procedure and that certain changes were mandatory in a large scale application. The lessons learned from the pilot study can be summarized as follows:

1. The sample selected for observation interview was too large, 12.5% of the air element and 19% of the land element. This was partially offset by the analysts gaining experience.

2. It was essential that, as far as possible, trade expertise should be available within the analysis section. This eliminates the "acquaint time" required by a "foreigner" to understand the methods and techniques.

3. Data collected are dangerous in the raw state and must be presented in a format which is understandable by the users to avoid misconceptions and possible wrong application.

4. It would be impossible for the analysis section to operate other than as a centralized function. Scattered field teams would be unable to effectively communicate.

5. Following on 4 above, it is advantageous to have the analysis function as a Headquarters responsibility to avoid undue influence being exerted on the function.

6. Key punching of data did not lend itself to rapid processing of responses.

Aside from the techniques developed one other important factor emerged based on the experience obtained with this pilot study. Certain characteristics and qualities that should be sought in selecting analysts were determined. These were attributes such as personal integrity, wide and varied trade knowledge, wide military employment, representation by analysts of the full trade spectrum of the Forces, recognition that analysts had to come from the former Navy, Army, and Air Force on a proportional basis, that analysts had to be able to express themselves fluently in oral and written communication, and, owing to the cultural differences existing in Canada, that several analysts had to be fluently bilingual. When career managers made their selection the Job Analysis Section was invited to examine the personnel documents of potential analysts. From this screening, decisions were made as to those who appeared to be suitable and where differences existed arrangements were made for interviews to be conducted to determine whether the nominee in fact possessed the qualities required. The analysis section has been fortunate that the Chief of Personnel Branch, as one of the primary users of the information, is appreciative of the fact that not just any serviceman can be selected for employment as an analyst, and a conscious effort is required by career managers to ensure that the best possible nominations are made.

THE PRESENT SYSTEM

The pilot programme refined the methods and procedures which are now used in the Canadian Forces and for purposes of explanation can be considered as three separate phases.

First Phase

In the first phase the selection of a particular trade area for men, or an officer classification, is made by the Chief of Personnel Branch in consultation with the Comptroller General Branch. The reason for not treating Job Analysis as a personnel function as would be expected is the Canadian Forces have chosen to look on the analysis function as an auditing activity. Although consultation between the authorities stated is the normal method of analysing a particular trade area, sufficient flexibility is retained so that analyses can be conducted on a "fire fighting" basis for any other agency should the need arise.

With the selection made under normal circumstances, the appropriate Office of Primary Interest is contacted to obtain advice concerning the best representative sample locations to conduct the observation interview phase. An important factor in this consultation is that observation interview must include all elements; land, sea and air, to ensure that a valid cross-section of employment is obtained. Having received the advice of the Office of Primary Interest analysts are detailed for the study and the Commands and Units involved in the representative sample are informed of dates of visits, the classification or the trade involved, etc., in accordance with a Canadian Forces Administrative Order. By referral to this order, the activities involved have an understanding of the analysis programme, its methods and objectives.

The analysts are dispatched to visit the Units previously informed by message and proceed to examine in detail by observation interview the job incumbents in the work situation. Also, at this time, the functional organization chart of the Unit being examined is obtained. This chart generally bears little relation to the organizational chart appearing in publications held at Canadian Forces Headquarters and more frequently describes the relationships existing within the Unit. The chart is used during the second phase when job titles are assigned. In addition to the determination of tasks and duties performed by job incumbents the analysts also assess the job from the standpoint of the characteristics of the worker (human factors) required by him for satisfactory performance. These characteristics cover some fifty factors which include physical strength, mental requirements, etc. Once all the Units of the sample have been covered the analysts return to Canadian Forces Headquarters for preparation of the task inventory.

Second Phase

The worker characteristics mentioned earlier are used by the Director of Personnel Selection and Research as inputs to the selection criteria which must be met before individuals join the Forces. Prior to constructing an inventory the analysts must resolve the number of jobs that were found to exist. On the basis of job similarity the observation interview sheets are broken out into various groups and, after discussion, job titles are assigned, one for each group. The job titles that are arrived at by this method of discussion generally bear no relation to the job titles existing within the Table of Organization and Establishment. However, our aim is to descriptively annotate jobs with titles that are meaningful and by using the descriptive title indicate a common level of responsibility. Irrespective of the size of an organization, the same title should convey the same meaning. The analysts now determine the worker characteristics

for each of the new jobs from each observation interview which are now arranged in stratified groups.

The next step is to take the task statements from each interview sheet and arrange them in a logical sequence. This sequence follows what may be considered a step-by-step process of performance of any duty. Because we possess within the analysis section technical expertise within any given trade we are able to construct a task inventory in the language appropriate to any classification or trade. The Office of Primary Interest is consulted and shown the draft copy of the inventory for comment. The input at this time from the Office of Primary Interest is that of a purely technical nature concerning equipments or systems that are known to be in the field since the occupational interview was conducted. With this input the inventory is then discussed with incumbents in the field under study to ensure that the meaning of task statements is clear. This is the final step prior to going to press. When printing is completed messages are sent to the Commands and Units employing officers or men in the field being studied to advise them of the dates of administration to their Units. At this time an advance copy of the inventory is sent to the Chief of Personnel Branch. Concurrent with the administration of the inventory to a classification or trade area the first phase of another trade or classification area is being conducted. This reduces the cost of travel and the time that analysts must remain away from home.

When the inventories are administered the analysts brief all personnel completing them on their purpose. In addition to the task statements which exist in the inventory men are encouraged to write in any task statements which they feel have been omitted from the inventory in describing their job. As the job incumbent completes the response booklet the analyst checks it for proper completion by ensuring the background information sheet shows rank, command, unit, time in job, education, and the job title as the man knows it within his organization. Knowing the job titles determined in the first phase, the analyst relates the man's description to the new job title and codes the response booklet accordingly. We consider that better responses are made by incumbents if the administration of the inventory is handled by an outside third party. Men do not feel constrained in their answers if they know they do not have to pass their completed response booklets to their supervisors.

Responses are made solely on the basis of the job men are performing at the time of inventory administration in one of four ways; whether he assists, does, does and supervises, or supervises a task. In addition, the incumbent makes a judgement as to where he obtained his knowledge to perform the task; outside the service, on the job, or through formal service training. This latter point is of particular importance when trade specifications are being re-written by the Chief of Personnel Branch in conjunction with the Office of Primary Interest and Training Command.

Once all response booklets have been completed at any particular Unit they are packed and shipped by the analysts to Canadian Forces Headquarters When all analysts have returned from the field after administering the inventory they edit the response booklets to ensure that all vital information has been properly filled in. Also, at this time any "write in" responses are examined to ensure their validity. Frequently, it is found that due to the number of statements in any one inventory, individuals will write in statements forgetting they have already responded in a prior section. Valid "write in" responses are included in the inventory for future use and the response booklets are now arranged for processing by an optical scanner.

Third Phase

Under a contract with the Government Service Bureau the individual response booklets are read by a Digitek optical scanner 100DM to tape. There is another built-in check during optical scanning which allows us to code "missing data select" during the reading and reject improperly completed sheets. By employing one analyst at the Bureau during the reading process corrections are made on the spot and the rejected sheet re-cycled back for reading to tape. Because of the different format of the response sheet and the background information sheet it is necessary to read each separately resulting in two tapes. The tapes are then sent to our own data processing centre where, by means of serial codes, the two tapes are merged to one which now gives us the complete response booklets in sequence on the single tape. The tape is then unscrambled and by a variety of programmes is manipulated so that we receive our print outs in what has now become a standard format. This format shows the task statement followed by percentage responses according to rank under the four conditions; assist, do, do and supervise, and supervise, as mentioned previously. Displayed in this manner it can be seen where participation in certain tasks becomes broken between actual task performance and supervision.

Receipt of the print out by the Chief of Personnel Branch brings together that Branch, the Office of Primary Interest and Training Command as the print out will now form the basis for a new Trade Specification. These three agencies examine the print out in detail because each has a definite responsibility for the production of new Trade Specifications. I would not like to give the impression that Job Analysis is the sole source of information with respect to Trade Specifications. Job Analysis can only look at a particular trade at a particular moment in time and does not have the ability to forecast performance or non-performance of tasks in the future. For this reason valid Trade Specifications are dependent on the input of Job Analysis, users of the trade product, and the Office of Primary Interest, who maintain an up-to-date appreciation of the State of the Art for any particular trade. This appreciation is based on the knowledge that new equipments, new techniques, new policies and new doctrines are constantly being developed.

Certain items found to exist by job analysis are deleted by the Office of Primary Interest because of changes having occurred between the time of administration and print out. The Training Command representative, who is responsible for translating the Trade Specification into lesson plans, course syllabi and course training standards, is acquainted at the outset of any changes in Trade Specifications so that he can more effectively and efficiently plan courses. He is also exposed to the philosophy and doctrine of the Office of Primary Interest and can carry this appreciation back to the training environment. This can reduce the communication problems that exist in a large organization.

THE FUTURE

We have not been content to develop a programme to satisfy the needs of any one user and we are now in a position to make the information available to all users having a need. The major data elements such as Command and Unit Identification Codes, ranks and environmental elements, Sea, Land and Air, used in processing response booklets are identical to those used in the developing Defence Management Information System. This will permit agencies requiring information access to our data along with other data to arrive at decisions based on all known information. Presentation of trade information in the manner described has now led us to question the differences or, more properly, the non-differences that exist in the performance of jobs according to rank. It would appear that it is difficult to discriminate between say, the performance of a Corporal, the performance of a Sergeant, and the performance of a Warrant Officer given the same set of tasks. According to our data there are probably only three levels of skill involved in any given trade; the learner, the worker and the supervisor. A case can be made for a fourth level of supervision where an individual is required to bring together in a managerial sense two allied but slightly diverse trades. If this is in fact so, then, what we have obtained can dramatically affect our whole method of rank structuring and following on from that our whole method of paying personnel in the Forces.

Availability of the data aids the On-Site Manpower Evaluation Team to determine the differences that exist between like units within the Canadian Forces, that is, like in terms of size, role, equipment, etc. Why should one unit be so very different in task performance to another and in the operational sense, what does one unit do more effectively than another like unit? Questions such as these require answering and Job Analysis data can provide much of the input needed for resolution. Perhaps most significantly, we are using the same data base for many purposes and this in turn reduces the communication difficulty which has hitherto existed between activities.

The worker characteristics we have found to be directly relatable to the pay evaluation tool used to evaluate trades for pay purposes within the Forces. This has opened up the possibility for use of the characteristics to resolve areas of conflict when pay evaluation boards sit yearly. By comparing the results of evaluation boards against computer manipulation of the worker characteristics it is possible to rank order trades for pay more objectively than has been possible in the past. At this time we are reluctant to proceed with the evaluation of pay using this somewhat mechanistic approach because pay is an emotional subject but we are considering modifications in anticipation that we will achieve the best of personal inputs and machine inputs.

CONCLUSION

This, then, is how the Canadian Armed Forces is progressing with the Job Analysis programme and some of the areas that are being opened up by means of analysis for further examination. It is perhaps unfortunate that we have not had the resources nor the time available to us to explore more of our information in a purely research application but we have been

restrained by manpower and money to produce on a priority basis the validation of officer classifications and men's Trade Specifications. Having been in operation for slightly more than three years the analysis of men's trades are now virtually complete on a "once over" basis and we are now tackling the officer classifications. As this is going on we will up-date our data base of trades commencing this Fall. It is apparent that once acceptance of the function of Job Analysis has been obtained and a programme initiated it is mandatory for a continuance of the effort to avoid standing still.

THE MILITARY OCCUPATIONAL DATA BANK AND JOB ANALYSIS

By

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The Army's Military Occupational Data Bank (MODB) has been fully operational for approximately a year. The time has come to undertake the task of making an appraisal of the MODB system to determine whether it has achieved its goals. It is necessary to examine the degree to which the Data Bank is assisting the Army in solving its problems in the area of manpower and personnel management. An analysis must be made to identify the modifications and system changes that are essential to increase its effectiveness in solving the old problems as well as providing the capability to undertake new ones. This appraisal and analysis is now being accomplished.

Before responding to the tasks and problems posed above, a brief background on the Data Bank will be provided to include the more important considerations that were involved in its formation and planning, some of the more unusual aspects of its operation, and the utilization of its output. This is necessary in order to provide the proper perspective for an appraisal of the system and some of the plans and modifications that are being considered for future implementation.

Basically, the Military Occupational Data Bank is an automated system for the collection, storage and retrieval of detailed military occupational information pertaining to every MOS within the Army. This occupational information describes the hundreds of tasks soldiers perform, the equipment they work with, and the skills and qualifications that are required to perform those tasks which make up their jobs. It is a means of bringing automation to job analysis.

In the past, the Army has used the observation-interview technique of job analysis by sending job analysts to the field to observe and interview the soldier on the job and record what he did. This method was expensive both in terms of money and the trained manpower required. As a result, it was impossible to achieve adequate coverage of all duty positions within an MOS or a complete analysis of jobs being performed under the multitude of varying conditions which prevail in the Army. One of the alternatives to the observation-interview technique was the use of secondary reference material. Under this system, job content was determined by researching all of the literature describing the job the equipment used, the organization in which the job occurred and environmental factors. While comparatively inexpensive, this method was inadequate since available information was often incomplete and generally out of date.

The gathering of occupational information by means of questionnaire best lends itself to world-wide data collection on a large scale. It is also flexible enough to meet changing conditions and requirements. Due to the recent development of reliable optical page reading equipment and high speed computers, large masses of data can easily be reduced for computer storage and rapidly processed. As a result, collection of data by means of questionnaire is the method used for providing information for input into the Data Bank.

While the Data Bank primarily was created to support the development and revision of MOS and the Army's job evaluation program, it was recognized that occupational information of this kind would be of value in support of other manpower and personnel functions. It would be of use in the development of policies pertinent to functions such as the procurement, training, assignment, promotion and separation of personnel. Such information also would be of value in selecting jobs appropriate for personnel currently being inducted into the Army who are below regular enlistment standards (Project 100,000), and in achieving better use of the two year soldier.

The advantages and economies to be accrued from the establishment of a single data base that could be used in support of a number of functions by different Army agencies determined the necessity to establish a broad base of users. Accordingly, a survey was conducted of the major commands and staff agencies both in the continental United States and overseas. The survey involved the briefing of fourteen staff agencies within the Department of the Army and major Army Commands to inform them of the objectives and potential utilization of the Data Bank and to determine their requirements for occupational information. The briefings were conducted by representatives from the Data Bank organization and the contractor, Operations Research Incorporated. Data were collected and recorded on survey forms specifically designed for the purpose.

The objective of the survey was to determine the various manpower and personnel functions that were being performed by DA staff agencies and major Army commands and the occupational information needed to carry out these functions. The survey forms contained, in addition to the instructions, four sections relating to the functions and data requirements of the agency responding to the items. The first section, Section A, of the survey form listed forty manpower and personnel management functions shown in Figure 1. Columns were provided on the survey form to indicate whether or not the function was being performed and if so, whether it was being performed as a primary mission or in support of another agency.

Section B was designed to show the occupational data required to perform the personnel management functions listed in Section A. Preliminary analysis isolated thirty occupational data items categorized into eight groupings as shown in Figure 2. Each of the eight categories were constructed to show the degree of detail or amount of specificity of the information desired. The occupational data items were listed in Section B. One column was provided to list the function or functions, if any, along side of each occupational data item for which the item was required. A second column provided the user the opportunity of indicating the frequency required for the updating of the information.

Section C provided a resume of the occupational items being developed by other agencies. The agency indicated the function for which each of the occupational data items were being developed and the frequency with which the information was being developed. The information in this section provided guidance as to possible areas of duplication of effort as well as areas with which it might be desirable to establish an interface between the Military Occupational Data Bank and other systems.

Section D, the last section of the survey form was used to determine the various types of output reports that potential users desired from the Data Bank. Twenty one potential reports shown in Figure 3 were listed in this section. One column on the survey form was included to show the function or functions, if any, for which the report would be used. Another column permitted the agency to show the frequency with which the report was required.

The survey form when completed provided information on the type of occupational data and the level of detail needed to support specific manpower and personnel functions in specific agencies and commands. It also identified the type of output reports required to support the various functions. All sections of the survey form were open-ended so that any related or additional functions or occupational data items could be added by the potential user. Written notations providing further information in specialized areas were also added. In total, this composed a sizable mass of data that had to be reduced to a manageable and meaningful level of detail. During the course of the analysis of these data, over 60 working matrices 18 by 30 inches in size were developed to show the relationships between functions, occupational data requirements, output reports, and agencies. The establishment of these various relationships provided a cross check to insure that the agency possessed a requirement for the information requested. This was necessary, since there appears to be a tendency in surveys such as this for an agency to either omit essential information requirements or to request information for which they have no use.

The analysis of the data showed that there was a high degree of similarity in the occupational data required by the majority of organizations in support of various personnel management functions. For example, Figure 4 shows a segment extracted from one of the matrices which relates occupational data items to functions. On the left of the chart are groupings of functions related to the development and maintenance of the MOS Structure and Personnel Allocation. Across the top of the chart are the occupational items representing duties and equipment worked on. This chart clearly demonstrates that the users wanted information at a very specific and detailed level. Under duties, information is desired at the element level, which is more commonly referred to as the task level. Under equipment worked on, information is desired on the specific make and model of the equipment.

Output reports are a critical consideration in the development of a new information system, since they are the end product and the reason for the system's existence. The data compiled from the survey form pertinent to output reports were carefully analyzed and evaluated to determine those reports which would be of the greatest value to the greatest number of users and support the greatest number of functions. Data on all reports were arrayed in matrices and then placed in rank order in accordance with several criteria. Those reports which ranked the highest were given the highest priority in the development schedule. All

of the 21 proposed reports which were included on the survey form were requested by one or more agencies and were related to one or more functions.

The results of three of the methods used in ranking the reports are shown in Figure 5. On the left are six reports which show the highest and the lowest ranked reports and four reports that fell between these extremes. The results shown here are representative of the results obtained on the ranking of all reports. Under Column 1, the reports are ranked in accordance with the percentage of agencies that requested the reports. Column 2 shows the ranking of reports by their utility to the agency functions. The results shown in Column 3 are the rank order of reports in relation to function.

As can be seen from this chart, while there are some deviations, the relationship of these reports to each other regardless of the method of ranking techniques used is fairly constant. The deviations are caused by the fact that the number of survey forms answered by the various users differed. The number of survey forms completed by the individual agency or command was dependent upon the functions and organization of the agency or command. In the Office of Personnel Operations and the Office of the Deputy Chief of Staff for Personnel, for example, survey forms were completed by several of the directorates within each organization due to the multi-functional personnel management responsibilities. The Office of The Judge Advocate General, as well as a number of other agencies, completed only one form for the entire agency.

The results of the analysis of the survey data were utilized to a large extent in the design of the various subsystems of the Military Occupational Data Bank including the questionnaires which are distributed to soldiers on a world-wide basis. Based on user demands, the system was designed so that it has the capability to retrieve information by the number of the Table of Organization (TO) or the Table of Distribution (TD) within which the job or duty position is being performed, duty position title, grade, and the education and experience of the job incumbent. This information as well as occupational information appears on the questionnaire. Some of the above data, such as the TO or TD number of his organization, is not generally known by the individual soldier. As a result, a data sheet was designed to be answered by some knowledgeable person such as the incumbent's First Sergeant.

The cover page of the questionnaire provides a brief explanation of its purpose and use. The next page contains some general instructions on the method to be used in responding to the items as well as some examples of correct and incorrect procedures. The first page of the questionnaire items shown in Figure 6 contains the organizational information which the soldier transcribes from the data sheet provided by his First Sergeant or some other knowledgeable individual. When the questionnaire is returned to the Data Bank, the information on the first page is coded and typed in optical character reading font to the right of the line running vertically down the page. This page is then ready along with the rest of questionnaire pages to be reduced to tape by optical character recognition equipment. The section of information on the right to be completed by the administrator or project officer encourages him to take more care in the administration of the questionnaire. Poorly administered questionnaires can be traced back to the point of origin and guidance can be provided to individual project officers or administrators.

Pages two and three of the questionnaire present biographical data pertinent to the soldier's actual and authorized pay grade, years of military service and civilian and military education. Page three is shown in Figure 7 as an illustration of the type of information collected. All of the information in the Data Bank can be retrieved on the basis of each item or combination of items that appear on the first three pages of the questionnaire.

Along the right margin of the page you will note two lines of figures that run parallel to the edge of the page. The first line represents the MOS, the section of the questionnaire, the page number, the number of pages in the questionnaire and the number of items on that page. The second line is the serial number of the questionnaire. This method of serialization or coding of each page provides distinct identification of every page of each questionnaire. If, for any reason, the questionnaire pages for an MOS or a number of different MOS become scrambled or shuffled together, the responses for the MOS will appear under the appropriate MOS in proper sequence in the computerized master file. This is accomplished through the programming of the computer and the optical character recognition equipment. A related series of programs tabulates by MOS, page and serial number any pages that may be missing and edits the pages for certain types of errors or incorrect responses.

Section 3 of the questionnaire provides data items on the tasks that soldiers perform. A typical page of task items is shown in Figure 8. The four columns to the right of the task items represent the frequency with which the soldier performs the task. Definition of each of the frequencies appears at the top of each page.

Section 4 of the questionnaire contains items of equipment as shown in Figure 9. The four columns to the right of the page indicate whether the soldier operates or uses the equipment and whether he performs other than operator maintenance on the equipment. This section provides valuable information as to types of equipment used in various duty positions and geographical areas as well as providing a means of checking on the reliability of the responses in the task section when an item of equipment is involved.

Section 5 consists of knowledge statements that are not easily related or translatable from previous sections of the questionnaire. Nevertheless, these knowledges are required in the performance of the job. Section 6 lists special requirements such as physical, environmental and security requirements. Two columns are provided in both Sections 5 and 6 in which the incumbent responds either positively or negatively.

Space is provided at the end of each section for the addition of items by the respondent. The last page of the questionnaire contains eight multiple choice questions which permit the respondent to provide an evaluation of the questionnaire pertinent to its length, clarity and ease of response. Additional space is provided for the job incumbent to make any other comments that he considers necessary or constructive. It takes about an hour and one half to complete the average questionnaire.

The Data Bank was developed at a highly accelerated pace in order to meet a deadline imposed by the Chief of Staff of the Army. Nineteen months after the project was started, the initial output reports were being produced. This time span encompassed the development of the entire system to include the sampling and distribution plan, the format and items. In order to meet our deadline, it was necessary to appeal to the United States Continental Army Command and the Army service schools to provide the items that appear in the questionnaires. The Questionnaire Development Section of the Data Bank organization reviewed and edited the items in order to achieve as great a degree of standardization of items as possible. Items were submitted by some 32 different service schools based on general guidance provided by the Data Bank.

Once the determination was made that data would be collected by means of questionnaires to be answered by soldiers in the field, consideration was given to the many costs which are involved in the sampling, distribution and administration of large questionnaire survey programs. As a result, it was decided to sample the Army on the basis of the three character MOS. In accordance with accepted statistical methods, a table of sample sizes was compiled since there is a wide variance in the population for each MOS. Except for the largest MOS populations, the sample size is at least 20 percent of the population of the MOS. The smaller the population of the MOS, the higher is the percentage of the population sampled.

When an MOS is being surveyed, the sample size is calculated on the basis of the latest population size for the MOS which is obtained from the United States Army Data Support Command. The sample size is stratified on the basis of major command to insure that adequate coverage is achieved of the job being performed under all possible varying conditions. All major commands are being sampled, including Vietnam and Korea. Instructions have been given to project officers to distribute and administer questionnaires to personnel in as many different duty positions as possible in different types of units. In this way, we acquire representative coverage for all or most of the duty positions within an MOS.

In order to carry out the objectives of the sampling plan, it was necessary to establish a system for the distribution and administration of the questionnaires on a world-wide basis. Past experience has shown that mailing out questionnaires to individual soldiers would result in a fairly low rate of return and there would be little, if any, control over their administration. That is, the questionnaire responses returned might represent not only the experience of the particular job incumbent, but also that of his buddies with whom he might collaborate when answering the questionnaire. This would not provide the desired information on the specific duty position. It was decided to establish a chain of command project officers to handle the distribution and administration of the questionnaires. This system provides for a high rate of return and assures objective and comparable administration procedures across all commands world-wide.

Questionnaires are dispatched directly to the project officer of each major command. Based on his knowledge and information pertaining to organizations and personnel within his command, he distributes the questionnaires to subordinate command project officers who actually are responsible for selecting the soldiers who answer the questionnaires. The subordinate command project officer also conducts the administration of the questionnaires and arranges for the necessary facilities conducive to obtaining the most objective answers from the group responding to the questionnaire. He is present while the job incumbents are answering the questionnaires, and upon completion reviews the questionnaires to assure that all pages are completely and properly filled out. The questionnaires are then returned to the major command project officer who sends them back to the Data Bank. Currently, the rate of return on questionnaires distributed is in excess of 70%.

Project officers have been provided with copies of the Data Collection Plan which contains necessary information and guidance for selecting the soldiers who are to be the respondents. The Department of the Army Military Personnel Management Teams are also assisting in the effort by isolating problems in specific areas and commands. They provide guidance to the project officers as well as reporting problems to the Data Bank staff for action.

Now that we have reviewed the methodology used in the acquisition of data, let us turn to the output reports and formats produced by the Military Occupational Data Bank. The basic format that is utilized for presenting output information from the Data Bank is the Back-Up Data Report, more commonly referred to as the BUD Report. This is our scheduled report which is on automatic distribution to the agencies and schools requiring the information. Each user will receive a copy of this report on the 3-character MOS, such as 74D, Machine Accounting Specialist, as well as copies for each of the duty positions within the MOS. In MOS 74D there are some 18 duty positions. The report contains four sections, covering Task Statements (Figure 10), Equipment Items (Figure 11), Knowledge Statements (Figure 12), and Special Requirements (Figure 13). The segments of the report shown in Figures 10 through 13 are for the 3 character MOS 74D. In each section, the numeric figure that appears to the immediate right of the item is the number of personnel who responded to the item. The percentages shown are based on this figure. The items shown here are sequenced according to the numerical code shown on the left margin of the chart. This provides an easy means of making reference to and comparisons of items across all of the various duty positions in an MOS since the particular item will appear on the same page and location of each report. These reports are also available wherein the items are sequenced in accordance with the percentages of personnel who perform, use, or require the item. The highest percentage appears at the beginning of the section and descends to the lowest percentage at the end of the section. This type of report facilitates the establishment of percentage cutoff points if this is desired by the user.

This report format can be produced for any item or combination of items that appear in the first two sections of the questionnaire as shown in Figure 14. These reports are one time or demand reports. The coding system utilized and computer programs that have been developed permit us to produce demand reports in different formats. One of the reports shows the number of items that are common to any number of 3-character MOS. Another report shows specific items that are common to all or any particular number of occupational fields, career groups or MOS. Programs have also been developed to provide reports on the job evaluation results for various duty positions based upon the Army's ten job evaluation factors.

Originally, it was planned to process 21 MOS per month, and that the 456 enlisted MOS would be completed by August 1970. Since we are time-sharing on the use of a third generation computer, competition from other systems for the available amount of computer time has proved to be a limiting factor. As a result, we are anticipating some slippage of the originally planned completion date. Upon completion of the enlisted MOS, the survey of the warrant officer and commissioned officer MOS will be started.

As of July of this year, there were 68 MOS in the bank which included more than 1200 duty positions. This information is being put to use in support of a number of personnel management functions and projects. The information provided by these reports provides support for:

MOS Design – The revision, validation and preparation of the new MOS as well as the elimination of existing MOS.

Training – Systems Engineering for Service School Training. The Army service schools are using this information to determine what training

is important and what is non-essential or appropriate for elimination or perhaps on-the-job training. It shows what level of training is required for a given job and what its extent should be.

Evaluation Tests – Development of enlisted MOS evaluation tests. Knowing exactly what a job requires permits the writing of more valid and fair evaluation tests. This is extremely important since these tests determine the award of proficiency pay, MOS verification, and qualification for promotion. The latter takes on special significance with the advent of centralized promotions at Headquarters, Department of the Army.

Job Evaluation – Pertinent information from the reports is analyzed and correlated with the Army's job evaluation factors, as indicated before, to determine the appropriate grade for the various duty positions within the MOS. In this way, we are able to carry out the policy of equal pay for equal work and responsibility.

Man-Job Match – Assignment of personnel by matching individual education, training, background and experience to the known requirements of a duty position. It enables us to identify positions that require special skills on special types of equipment, appropriate positions for Project 100,000 personnel or at the other end of the scale for enlisted college graduates.

Tables of Organization and Tables of Distribution – Determination of duty position requirements in different types of organizations. Faulty organization in terms of inappropriately authorized MOS or duty positions can be isolated so that appropriate corrective action can be taken.

The following specific examples will give some idea as to the part the Data Bank is already playing in personnel management. Figure 15 shows how information from the Data Bank high-lighted what appears to be a waste of trained manpower in the Radio Operator MOS. Two tasks, to transmit and receive Morse Code, were compared by duty position in this MOS. These two tasks represent the most difficult and time-consuming part of the training of Intermediate Speed Radio Operators. The analysis shows that at the journeyman level, less than half of the operators do what they were specifically trained for. In surprising contrast to this is the percent of Chief Radio Operators and Supervisors who said that they perform these tasks. Further analysis is being undertaken to determine what causes this situation, but it appears that some organizations contain authorizations for Intermediate Speed Radio Operators when lesser trained Radio-Telephone Operators would suffice. The significant point here, however, is that a problem area which has probably existed for some time, has been identified through the use of Data Bank information. Action can now be taken to rectify this situation resulting in reduction of training and more economical use of manpower.

In another instance the Data Bank item statements were analyzed for the two MOS for Data Processing Equipment Operator and Machine Accounting Specialist. The analysis revealed a large number of tasks that were being performed that were common to both of these MOS in the Data Processing Career Group. Figure 16 shows the two major operational areas of peripheral equipment operations and punch card operations, which are included in both MOS and the degree of duplication between each of the MOS in these operational areas. As a result of this information and analysis, the two MOS have been consolidated into one.

Finally, Figure 17 which was derived from Data Bank information shows the percentage of personnel in each of the MOS in the Data Processing career group who required secret clearances. This substantiated the requirement for a secret security clearance for personnel entering the career group. Action has been taken to include this requirement in the specifications for all MOS in the Data Processing career group.

These are representative examples of what has been accomplished through the use of information from the Military Occupational Data Bank. They take on important significance when one considers that they result from the preliminary evaluation of comparatively few MOS. When the Data Bank achieves its full potential and the data base is complete, we will begin taking all personnel actions based on a solid knowledge of personnel or job requirements. This will take us a long way toward elimination of over-training and under-training of personnel and the mis-matching of jobs and men. In short, we will have the capability to make the best possible use of the Army's manpower.

Thus far, we have reviewed the development and operation of the current Military Occupational Data Bank system and cited some examples of the uses of the output reports. Although a high degree of success has been achieved, many problems still exist. Undoubtedly changing technology and changes in the Army's mission and operations will bring about further problems. Success in itself

creates problems since it encourages agencies to place more and greater demands upon the system, which result in an increased requirement for computer time and hardware.

Currently changes are being made to improve the Military Occupational Data Bank both in the areas of operations and output reports. These changes, however, are limited by the capabilities of the current system. Some experimental projects are being conducted in job evaluation to determine the best method for acquiring responses to items related to the factors utilized in establishing pay grades for the various duty positions with MOS. Effort is being expended on determining the most effective means of validating the data that are being received through the current data collection system. Changes are being made to questionnaires to increase the reliability of the responses.

Among the immediate problems that must be solved is the fairly common one of reports that are too voluminous or do not quite meet the exact requirements for the support of a particular function or solution of a particular problem. As a result, the users must expend a great deal of time and effort in analysis in order to isolate the information and data they require to support their conclusions and recommendations. While the majority of users agree that occupational information is required at the task level, there is some essential disagreement as to how the tasks should be grouped or sequenced. Occupational analysts who are engaged in the development and revision of MOS desire that output reports show the relationship of tasks to specific duties. Other users desire that the tasks be grouped on a functional basis. Training analysts want tasks sequenced in an order that corresponds as closely as possible to the organization of their training curricula and lesson plans. Above all, there is an urgent requirement for standardization of the terminology utilized by the various agencies. These are but a few of the problems that we are now facing.

Many of these problems will be solved only through a thorough understanding by all concerned of the technical operation of the Data Bank system and the other systems with which it must interface. Much may have to be accomplished through a process of compromise. Perhaps the area of greatest concern is where it is necessary to provide information to users who are not system oriented. Where the decision-making process has been based upon the experience of a few people or little data, it has been necessary to expand the interpretation of these data to represent the universe about which they have to make the decision. When confronted with the situation of almost complete knowledge of the universe with all of its vagaries and contradictions, the decision-making process may become infinitely more difficult due to the increased number of variables to be considered. In this instance it is mandatory that a system be established which permits the use of statistical computation and computer analysis to the greatest extent possible. This is not to say, however, that the information provided by the Data Bank and computer analysis will eliminate the requirement for seasoned judgment in personnel management. Rather, it will supply the basis to which experience and seasoned judgment can be applied, to arrive at more effective decisions.

In order to solve the problems mentioned above, and if the Data Bank is to realize its full potential, more extensive changes are required than can be accomplished within the limitations of the current system. As a result, a major system change is now being planned. A phased method for effecting this change and bringing about a smooth transition from the current system to the improved system has been developed and approved. Application of this methodology will provide the capability of finding solutions to current problems as well as anticipating future problems and their solutions. This methodology takes into consideration the details of user requirements and interfacing systems, Data Bank operations, data collection and analysis, and computer hardware configurations and requirements as well as computer programs and system software requirements. All of these elements must be considered on an integrated basis if the Military Occupational Data Bank is to achieve its full effectiveness and provide the type of information and assistance that the Army needs.

While the responsibility for the Military Occupational Data Bank, including its future development and improvement resides within the Personnel Management Development Office, we consider that the key to effecting constructive changes and improvements is the System Development Team, Figure 18, which has been established. This team is chaired by the Chief of the Personnel Management Development Office since he must approve all major changes to be made to the Data Bank. The remainder of the team consists of two Occupational Analysts or subject matter specialists, a Computer Systems Analyst, a Management Analyst, a Recorder and representatives from other agencies as required.

The two Occupational Analysts or subject matter specialists represent the branch of our office which is responsible for the development and revision of MOS and the application of job evaluation techniques to insure the development and maintenance of equitable standards of grade authorization for each MOS. The Computer Systems Analyst advises on the ADP feasibility of the proposed changes and estimates the extent of software changes and programming requirements as well as the hardware configuration needed and the additional computer time required by the change. He also provides liaison with the United States Army Data Support Command which provides the computer support. As specific problems are encountered, representatives from appropriate agencies concerned with this problem will be added to the team. The Management System Analyst analyzes the proposed change from an over-all point of view of its compatibility with the entire system and also from the point of view of cost effectiveness. While some changes may be desirable, the cost is too great to be justified by the results to be achieved. The Recorder documents what transpires at each session. In a military organization, or any other organization where there is a consistently high turnover of personnel, documentation is most important. It provides new and replacement personnel from all agencies concerned with the reasoning for making changes in the past which will have an impact on future plans and operations.

This team possesses the necessary knowledge of the Data Bank system and interfacing systems to be able to isolate, define and evaluate problems. Inadequate problem definition has been the cause of many of the Data Bank's problems. This was due to the fact that the users did not possess adequate knowledge and information on the details of the Data Bank and, in part, to the fact that user representatives were not oriented in the use of computer systems for solving problems. The Research and Analysis Section of the Military Occupational Data Branch will be available to assist in developing systems to best analyze and utilize Data Bank information and output reports. The System Development Team will be responsible to monitor and analyze problems and changes to the system through the definition, development and implementation phases of the system change process and to conduct the final analysis and evaluation prior to the system change becoming operational. A concept paper embodying the details of our method for effecting changes to the system and the System Development Team was presented to the Department of Defense Computer Institute. They considered this an excellent approach to the maintenance of a viable information system.

In conclusion, I would like to state that we regard the Military Occupational Data Bank as a successful venture. Particularly, in view of the limited and accelerated time frame permitted for the development of an operating system. It has started to pay off in the area of personnel management as demonstrated by the examples that have been presented, which illustrate but a very few of the results achieved on the basis of MODB Reports. We are anticipating larger gains and dividends in the future. Along with these, we fully anticipate problems that may be equally as complex and difficult to solve as the establishment of the initial Data Bank system. This is due to the fact that we are operating a multi-user Data Bank and the most effective utilization of information systems and computerized analysis is a fairly new technique to many users. The key to continued and future success will be the ability to maintain system flexibility so that we can provide service for new projects as well as meeting the changing requirements of our current users which will be imposed by the changing environment in which the Army will be required to perform its mission.

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ARMY MANPOWER AND PERSONNEL MANAGEMENT FUNCTIONS

1. DEVELOPMENT OF ENLISTED MOS SPECIFICATIONS
2. DEVELOPMENT OF WARRANT OFFICER MOS SPECIFICATIONS
3. DEVELOPMENT OF COMMISSIONED OFFICER MOS SPECIFICATIONS
4. MONITORING OF MOS STRUCTURE FOR POSSIBLE SHREDOUT
5. ESTABLISHMENT OF RELATIONS BETWEEN JOBS
6. ESTABLISHMENT OF RELATIONS BETWEEN JOB FAMILY GROUPINGS
7. DEVELOPMENT OF PROFICIENCY TEST MATERIAL
8. DEVELOPMENT OF SELECTION TEST MATERIAL
9. ESTABLISHMENT OF JOB PERFORMANCE STANDARDS
10. DEVELOPMENT OF PROFICIENCY RATING SCALES
11. ASSIGNMENT OF PERSONNEL
12. CLASSIFICATION/RECLASSIFICATION OF PERSONNEL
13. SELECTION OF PERSONNEL
14. DEVELOPMENT OF TRAINING REQUIREMENTS
15. ESTABLISHMENT OF GRADE STRUCTURE
16. DEVELOPMENT OF COUNSELING TOOLS
17. ESTABLISHMENT/REVIEW/REVISION OF MANNING TABLES
18. DEVELOPMENT OF PROCEDURES FOR USE OF MARGINAL MAN
19. ESTABLISHMENT OF NEW/REVISED ORGANIZATIONAL CONCEPTS
20. ESTABLISHMENT/REVISION OF DOCTRINE
21. VALIDATION OF MANPOWER REQUIREMENTS
22. DETERMINATION OF DEGREE OF UNIT READINESS
23. ESTABLISHMENT OF STANDARDS OF GRADE AUTHORIZATION
24. ESTABLISHMENT OF NEW OR REVISED OFFICER SPECIALIST PROGRAMS
25. RECOMMENDATION OF MOS ADDITIONS/CHANGES/DELETIONS
26. ESTABLISHMENT OF MANPOWER AUTHORIZATIONS
27. ESTABLISHMENT OF MANPOWER REQUIREMENTS
28. DEVELOPMENT OF TRAINING AIDS
29. DEVELOPMENT OF TRAINING SCHEDULES
30. DEVELOPMENT OF TRAINING PHILOSOPHIES
31. DEVELOPMENT POIS
32. DEVELOPMENT OF LESSON PLANS
33. DEVELOPMENT OF SCHOOL CURRICULA
34. CONDUCT OF BASIC TRAINING
35. CONDUCT OF ADVANCED INDIVIDUAL TRAINING (AIT)
36. CONDUCT OF MOS TRAINING
37. CONDUCT OF UNIT TRAINING
38. CONDUCT OF NEW EQUIPMENT TRAINING
39. CONDUCT OF ON-THE-JOB TRAINING (OJT)
40. DEVELOPMENT OF RELATIONS BETWEEN APPITUDE AND PROFICIENT TESTS AND MOS

Figure 1

OCCUPATIONAL DATA ITEMS

DUTIES

AT AREA LEVEL (TECHNICAL SUPERVISION, MEDICAL, LABORATORY ETC)
AT ITEM LEVEL (COLLECT SPECIMENS)
AT ELEMENT LEVEL (COLLECT BLOOD SPECIMENS)

ELIGIBILITY FACTORS

PHYSICAL (SPECIFY TYPE DATA)
MENTAL (" " ")
EDUCATIONAL(" " ")
SECURITY (" " ")
SERVICE (" " ")
OTHER (" " ")

SKILLS/KNOWLEDGES

AT AREA LEVEL (ADMINISTRATION, LABORATORY TECHNIQUES, ETC)
AT SUBJECT LEVEL (STAINING TECHNIQUES)
AT ITEM LEVEL (STAINING TECHNIQUES FOR BIOPSY SAMPLES)

PERFORMANCE REQUIREMENTS

DEGREE OF DUTY/TASK CRITICALITY
LEVELS OF PERFORMANCE STATED IN TERMS OF (SPECIFY)

RESOURCES REQUIRED FOR DUTY PERFORMANCE

GENERAL TYPE (TEST INSTRUMENTS, LABORATORY EQUIPMENT)
SPECIFIC ITEM (BLOOD CELL COUNTER)

EQUIPMENT WORKED ON IN DUTY PERFORMANCE

GENERAL TYPE (MEDICAL, AIRCRAFT, ETC)
CLASS (RADIOLOGY, FIXED WING, ETC)
COMPONENT CLASS (RECTIFIER CIRCUITS, TURBINES, ETC)
SPECIFIC ITEM (50MA X-RAY, CH 21C HELICOPTER)

OPERATING ENVIRONMENT

TYPES OF OPERATIONS (COUNTER INSURGENCY)
TYPES OF MISSION (SEARCH AND CLEAR)
LOCATION OF OPERATION (ARTIC, TROPICAL, ETC)
TYPE OF UNIT (SPECIAL FORCES, ENGINEER, ETC)
WORKING CONDITIONS (AMOUNT OF LIGHT, NOISE, ETC)
HAZARDS (COMBAT, RADIOLOGICAL, HEIGHT, ETC)
SAFETY PROVISIONS

TRAINING

AT SCHOOL CURRICULA LEVEL (COURSE TITLES AND LENGTH)
AT SUBJECT LIST AND HOURS OF INSTRUCTION LEVEL
AT LESSON PLAN LEVEL

FIGURE 2

ANTICIPATED DATA BANK OUTPUT REPORTS

1. COMPLETE MOS SPECIFICATIONS (DIRECT PRINTOUT)
2. COMPLETE OCCUPATIONAL DATA BACKUP FOR MOS SPECIFICATIONS
3. OUTLINE OF DATA BACKUP FOR MOS SPECIFICATIONS
4. CATALOG, BY TYPE OF DATA, OF THE CONTENTS OF THE DATA BANK
5. LISTING OF DUTIES, SKILLS, KNOWLEDGES, ETC. COMMON TO ALL MOSs IN A CAREER GROUP
6. LISTING OF DUTIES, SKILLS, KNOWLEDGES, ETC. COMMON TO ALL MOSs IN AN OCCUPATIONAL FIELD
7. LISTING OF COMMON DUTIES, SKILLS, KNOWLEDGES, ETC. WHICH CUT ACROSS CURRENT CAREER GROUPS
8. LISTING OF COMMON DUTIES, SKILLS, KNOWLEDGES, ETC. WHICH CUT ACROSS OCCUPATIONAL FIELDS
9. PERSONNEL STANDARDS LISTING GIVING:

9.1. QUALIFICATIONS FOR HOLDING AN MOS
9.2. SELECTION STANDARDS
9.3 EVIDENCE OF SIMILAR QUALIFICATIONS AND/OR STANDARDS ACROSS MOSs
9.4. ELIGIBILITY FACTORS

10. GROUPING OF PERSONNEL BY VARIOUS OPERATIONAL CLASSIFICATIONS (I.E., HARD SKILLS)
11. GROUPINGS BASED ON JOB EVALUATION FACTORS CURRENTLY BEING DEVELOPED BY OPO
12. LISTING OF MOS ASSOCIATED WITH EACH MAJOR PIECE OF EQUIPMENT AND WEAPON SYSTEM
13. LISTING OF STANDARD OF GRADE AUTHORIZATIONS FOR EACH MOS BY DUTY POSITION
14. LISTING, BY TD AND TOE POSITION, OF APPROPRIATE MOS TO FILL THAT POSITION
15. LISTING OF NEW/UNUSUAL MOS REQUIREMENTS OF STANDARDS FOR NEW EQUIPMENT OR SYSTEMS
16. LISTING, BY NEW ORGANIZATIONS UNDER DEVELOPMENT, OF PREDICTED NEED FOR NEW OR REVISED MOSs
17. LISTING FOR OFFICER MOS BY POSITIONS BY BRANCH AS COMPARED TO TOTAL BRANCH INCIDENCE RATE
18. LISTING OF CURRENT DOD OCCUPATIONAL GROUPINGS OF MOSs
19. LISTING OF DICTIONARY OF OCCUPATIONAL TITLES (DOT) ASSOCIATED WITH EACH MOS
20. LISTING OF FEDERAL CIVIL SERVICE CODES ASSOCIATED WITH EACH MOS
21. LISTING OF IDEAL AND ACTUAL MOS FEEDER PATTERNS

Figure 3

FUNCTIONS	OCCUPATIONAL DATA ITEMS	RELATION OF OCCUPATIONAL DATA ITEMS TO FUNCTION						
		DUTIES			EQUIPMENT WORKED ON:			
		AREA LEVEL	ITEM LEVEL	ELEMENT LEVEL	GENERAL TYPE	CLASS	COMPONENT CLASS	SPECIFIC ITEM
MOS STRUCTURE	DEVELOPMENT OF ENLISTED MOS SPECIFICATIONS	1	1	11	1	1	-	3
	DEVELOPMENT OF WARRANT MOS SPECIFICATIONS	1	3	5	2	-	-	3
	DEVELOPMENT OF OFFICER MOS SPECIFICATIONS	3	2	6	2	-	-	3
	MONITORING OF MOS FOR CHANGES	1	2	11	1	2	-	3
	ESTABLISHMENT OF RELATIONS BETWEEN JOBS	1	1	7	-	2	-	1
	ESTABLISHMENT OF RELATIONS BETWEEN JOB GROUPS	1	1	8	-	2	-	2
	RECOMMENDATION OF MOS CHANGES, ADDITIONS AND DELETIONS	1	6	15	2	2	-	6
PERSONNEL ALLOCATION	ASSIGNMENT OF PERSONNEL	7	3	12	1	4	-	7
	CLASSIFICATION AND RECLASSIFICATION OF PERSONNEL	3	2	9	1	2	-	2
	SELECTION OF PERSONNEL	2	-	13	1	2	-	5

FIGURE 4

OUTPUT REPORTS	1 PERCENT OF AGENCIES REQUESTING REPORT	2 RANKING OF UTILITY TO AGENCY	3 RANK ORDER IN RELATION TO FUNCTION
COMPLETE MOS SPECIFICATIONS	100	2	2
CATALOG OF CONTENTS OF THE DATA BANK	94	1	1
DUTIES, SKILLS, KNOWLEDGES, ETC., COMMON TO ALL MOS IN OCCUPATIONAL FIELD	86	7	7
PERSONNEL STANDARDS DATA	72	12	13
CURRENT DOD OCCUPATIONAL GROUPINGS OF MOS	64	18	21
DICTIONARY OF OCCUPATIONAL TITLES (DOT) ASSOCIATED WITH EACH MOS	50	21	24

FIGURE 5

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SECTION 1: ORGANIZATIONAL INFORMATION

PRINT THE ANSWER TO THE FOLLOWING QUESTIONS IN THE ANSWER COLUMN.

QUESTION	ANSWER
What is the military designation of the unit to which you are assigned?	
Is your unit a TOE or TDA unit? (If TOE, print TOE in line 1) (If TDA, print TDA in line 1)	1.
What is the TOE or TDA number of your unit?	2.
What is your 5-character duty MOS?	3.
What is your actual duty position title? (From the TOE or TDA)	4.
What is the TOE or TDA paragraph and line number of your actual duty position?	5. Par. #
	6. Line #
What is your 5-character primary MOS? (Awarded by appropriate authority)	7.
What is your current location? (Print name of country, except, indicate state name for Hawaii or Alaska.)	8.

FIGURE 6

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____

For completion by Administrator ONLY

This questionnaire has been administered and reviewed in accordance with the MOIDB Data Collection Plan.

(Signature)

(Name printed) (Rank)

(Organization)

(Date)

SECTION 2: BIOGRAPHICAL DATA

FILL IN THE SPACE IN THE ANSWER COLUMN THAT MOST NEARLY APPLIES TO YOU.

	QUESTION		ANSWER COLUMN
5.	How long have you been in the Army?	Less than 1 year	☐
		1 year to 4 years	☐
		4 years to 7 years	☐
		7 years to 10 years	☐
		10 years to 15 years	☐
		15 years to 20 years	☐
		Over 20 years	☐
6.	What is the total time you have been in your present Duty Position?	Less than 6 months	☐
		6 months to 2 years	☐
		2 years to 5 years	☐
		Over 5 years	☐
7.	What is the source or sources of training for your present Duty Position?	On-the-job training	☐
		Advanced Individual Training (AIT)	☐
		CONUS School	☐
		Command or Unit Sponsored School	☐
		Contractor training	☐
		Civil Schooling	☐
8.	What is the highest level of civilian education which you have completed (to include GED credit)?	4th Grade	☐
		8th Grade	☐
		High School	☐
		1 year College	☐
		2 year College	☐
		4 year College	☐
		Graduate Degree	☐

STOP -- DO NOT CONTINUE UNTIL TOLD TO DO SO ☐

FIGURE 7

SECTION 3: TASK STATEMENTS

FILL IN THE ANSWER SPACE IN THE:

- **NO** COLUMN, IF NOT DONE.
- **SELDOM** COLUMN, IF DONE LESS THAN ONCE A MONTH.
- **OCCASIONALLY** COLUMN, IF DONE MORE THAN ONCE A MONTH, BUT LESS THAN 2 OR 3 TIMES A WEEK.
- **FREQUENTLY** COLUMN, IF DONE 2 OR 3 TIMES A WEEK OR MORE.

	TASK STATEMENTS		NO	SELDOM	OCCASIONALLY	FREQUENTLY
1.	INSTALL LINE PACKS	1	□	□	□	□
2.	INSTALL TRUNK PACKS	2	□	□	□	□
3.	INSTALL OPERATORS PACK	3	□	□	□	□
4.	CONNECT HEAD SET TO OPERATORS PACK	4	□	□	□	□
5.	DISCONNECT SWITCHBOARDS	5	□	□	□	□
6.	PATCH CIRCUITS	6	□	□	□	□
7.	PERFORM LINE TESTS	7	□	□	□	□
8.	TEST 26 PAIR CABLE	8	□	□	□	□
9.	TEST MANHOLES FOR GAS	9	□	□	□	□
10.	RACK CABLE IN MANHOLES	10	□	□	□	□
11.	BOND CABLE IN MANHOLES	11	□	□	□	□
12.	INSTALL LOADING COILS	12	□	□	□	□
13.	MOUNT TERMINAL CANS	13	□	□	□	□
14.	EMPLOY CARBON MONOXIDE AMPOULE DETECTOR	14	□	□	□	□
15.	VENTILATE MANHOLES USING BLOWER	15	□	□	□	□
16.	OPERATE CENTRIFUGAL WATER PUMP	16	□	□	□	□
17.	CLIMB POLES USING CLIMBERS	17	□	□	□	□
18.	RAISE LADDER USING TWO MAN METHOD	18	□	□	□	□
19.	RAISE AND LOWER TOOLS USING HANDLINE	19	□	□	□	□
20.	RAISE AND LOWER LADDER ONE MAN METHOD	20	□	□	□	□
21.	RIDE CABLE CAR	21	□	□	□	□
22.	SPLICE SPIRAL FOUR CABLE	22	□	□	□	□
23.	USE K-38 CABLE TRAILER	23	□	□	□	□
24.	USE CABLE TRUCK	24	□	□	□	□
25.	ANALYZE CABLE TROUBLE	25	□	□	□	□

E/3EC/3/12/3H/25/

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FIGURE 8

SECTION 4: EQUIPMENT ITEMS

BE SURE TO ANSWER TWICE FOR EACH ITEM OF EQUIPMENT:
ONCE IN THE OPERATE/USE COLUMN, AND
ONCE IN THE MAINTAIN COLUMN.

	EQUIPMENT ITEMS		OPERATE/USE		MAINTAIN (OTHER THAN OPER MAINT)	
			YES	NO	YES	NO
1.	GENERATOR SET PU-286	1	☐	☐	☐	☐
2.	SWITCHBOARD SB-22/PT	2	☐	☐	☐	☐
3.	REELING MACHINE RL-31	3	☐	☐	☐	☐
4.	CENTRAL OFFICE TEL AN/MIC-7	4	☐	☐	☐	☐
5.	TELEPHONE REPEATER AN/TCC-11	5	☐	☐	☐	☐
6.	TELEPHONE SET, TA-1/PT	6	☐	☐	☐	☐
7.	COIL, REPEATER, TELEPHONE C-161	7	☐	☐	☐	☐
8.	TELEPHONE SET TA-236/PT	8	☐	☐	☐	☐
9.	TYPEWRITER	9	☐	☐	☐	☐
10.	GENERATOR SET PE-75	10	☐	☐	☐	☐
11.	MULTIMETER TS-352/U	11	☐	☐	☐	☐
12.	REEL RL-159/U	12	☐	☐	☐	☐
13.	CABLE ASSEMBLY CX-1512/U	13	☐	☐	☐	☐
14.	CABLE REEL DR-5	14	☐	☐	☐	☐
15.	CABLE LAYER LC-236/MT	15	☐	☐	☐	☐
16.	TELEPHONE REPEATER TA-287/G	16	☐	☐	☐	☐
17.	CABLE SPLICING KIT MK-356/G	17	☐	☐	☐	☐
18.	REELING MACHINE RL-27	18	☐	☐	☐	☐
19.	DISTRIBUTION BOX J-1077/U	19	☐	☐	☐	☐
20.	PANEL, PATCHING COMMUNICATION SB-611/MRC	20	☐	☐	☐	☐
21.	PANEL, PATCHING COMMUNICATION SB-675/MRC	21	☐	☐	☐	☐
22.	SIGNAL ASSEMBLY, SWITCHBOARD TA-207/P	22	☐	☐	☐	☐
23.	TERMINAL STRIP TM-184	23	☐	☐	☐	☐
24.	TELEPHONE SET TA-263/FT	24	☐	☐	☐	☐
25.	COIL ASSEMBLY, TELEPHONE LOADING CU-260/G	25	☐	☐	☐	☐

E/36C/4/30/34/25/

1136

FIGURE 9

PROGRAM 7415 PAGE 7

BUD REPORT - CUTOFF PERCENTAGE - 0 08/11/68

MOS E 74D MACHINE ACCOUNTING SPECIALIST REQUEST 0012 TRANSACTION 1450

SAMPLE SIZE 206

3	TASK STATEMENTS		PERCENT DO	SELDOM	PERCENT OCCAS	FREQ
3151	ADP CARD PUNCH OPERATIONS					
3151001	PREPARE PUNCHED CARDS	194	88	6	8	74
3151002	PRINT A PUNCHED CARD	196	89	5	8	76
3151003	PREPARE A PROGRAM CARD	194	76	17	20	39
3151004	USE PROGRAM CARD	194	82	13	15	54
3151005	CORRECT ERRORS IN PUNCHED CARDS	197	95	7	13	75
3151006	REJECT MUTILATED PUNCHED CARDS	197	88	10	10	68
3151007	DUPLICATE PUNCHED CARDS	198	96	3	7	86
3151008	CHANGE PRINT RIBBON	196	87	22	21	44
3151009	CLEAR CARD JAMS	201	93	6	15	72
3151015	SELECT PUNCHED CARDS BY REJECTION	201	89	6	12	71

FIGURE 10

PROGRAM 7415 PAGE 27

BUD REPORT - CUTOFF PERCENTAGE - 0 08/11/68

MOS E 74D MACHINE ACCOUNTING SPECIALIST REQUEST 0012 TRANSACTION 1450

SAMPLE SIZE 206

4	EQUIPMENT ITEMS		PERCENT USE			PERCENT MAINTAIN	
			YES	NO		YES	NO
4010	ADP EQUIPMENT						
4010001	PRINTING CARD PUNCH	179	74	26	178	15	85
4010002	CARD PUNCH	181	82	18	175	15	85
4010003	VERIFIER	183	53	47	177	12	88
4010004	SORTER	183	89	11	178	20	80
4010005	DOCUMENT ORIGINATING MACHINE ADPE	183	41	59	178	8	92
4010006	SUMMARY PUNCH CABLE	184	39	61	179	8	92
4010007	INTERPRETER	198	87	13	189	20	80
4010008	CARD PROCESSOR	198	69	31	193	15	85
4010009	DATA TRANSCEIVER ADPE	198	11	89	191	2	98
4010011	DATA TERMINAL ADPE	200	8	92	193	1	99
4010012	PUNCHED PAPER TYPEWRITER	196	14	86	189	3	97

FIGURE 11

BUD REPORT - CUTOFF PERCENTAGE - 0 08/11/68

MOS E 74D MACHINE ACCOUNTING SPECIALIST REQUEST 0012 TRANSACTION 1450

SAMPLE SIZE 206

5	KNOWLEDGE STATEMENTS		PERCENT REQUIRED YES	NO
5001	GENERAL KNOWLEDGES			
5001001	KNOW ORGANIZATION OF THE ARMY	201	55	45
5001002	KNOW THE ORGANIZATION OF UNIT TO WHICH ASSIGNED	200	82	18
5001003	KNOW THE FUNCTION OF UNIT TO WHICH ASSIGNED	199	87	13
5001004	KNOW SOP OF UNIT TO WHICH ASSIGNED	196	80	20
5001005	KNOW THE MISSION OF UNIT TO WHICH ASSIGNED	199	86	14
5001006	KNOW FUNCTION OF STAFF SECTIONS IN HIGHER UNITS	196	32	68
5001007	KNOW FUNCTION OF STAFF SECTIONS IN COMPARABLE UNITS	198	25	75
5001008	KNOW MISSION OF STAFF SECTIONS IN HIGHER UNITS	200	22	78
5001009	KNOW THE MISSION OF STAFF SECTIONS IN COMPARABLE UNITS	198	22	78
5001010	KNOW THE OPERATIONS OF UNIT TO WHICH ASSIGNED	197	86	14
5001011	KNOW THE RESPONSIBILITIES OF UNIT TO WHICH ASSIGNED	198	85	15

FIGURE 12

PROGRAM 7415 PAGE 30

BUD REPORT - CUTOFF PERCENTAGE - 0 08/11/68

MOS E 74D MACHINE ACCOUNTING SPECIALIST REQUEST 0012 TRANSACTION 1450

SAMPLE SIZE 206

6	SPECIAL REQUIREMENTS		PERCENT REQUIRED YES	NO
6001	GENERAL SPECIAL REQUIREMENTS			
6001001	NEED A CONFIDENTIAL SECURITY CLEARANCE	196	39	61
6001002	NEED A SECRET SECURITY CLEARANCE	196	40	60
6001003	NEED A TOP SECRET SECURITY CLEARANCE	197	5	95
6001004	NEED A SPECIAL SECURITY CLEARANCE	198	4	96
6001005	SPEAK ONE FOREIGN LANGUAGE	200	8	92
6001006	SPEAK TWO OR MORE FOREIGN LANGUAGES	200	1	99
6001009	HEAR LOW SOUNDS SUCH AS A FAINT WHISPER	200	16	84
6001010	LOCATE THE DIRECTION OF A SOUND BEFORE SEEING THE OBJECT	200	21	79
6001011	LOOK AT AN OBJECT FOR TWO OR MORE HOURS	200	22	78
6001012	SEE SMALL FEATURES OF AN OBJECT WITHIN 10 INCHES OF EYE	198	36	64
6001013	SEE DETAILED FEATURES OF OBJECTS FARTHER THAN 20FT AWAY	200	14	86

FIGURE 13

PROGRAM 7415

BUD REPORT - CUTOFF PERCENTAGE =0

12/09/68
REQUEST 0025 TRANSACTION 1450

MOS E 11G INFANTRY SENIOR SERGEANT

(27) TYPE-ORG (a) TOE/TDA-NO (b) PARA-NO (c) LINE-NO (d) LOC (e) TIME-HY-POS (f) DY-POS (g) PAY-GR-AUTH (h) POS-AUTH (i) PAY-GR (j) LGTH-OF-SVC (k) EL (l) TNG (m) NCO-SP (n) PMOS (o) DYMOS (p) 5 (28)

SAMPLE SIZE 443

		PERCENT DO	PERCENT SELDM	PERCENT OCCAS	PERCENT FREQU
3	U TASK STATEMENTS				
3101	GENERAL ADMINISTRATION				
3101035	U RECOMMEND PERSONNEL FOR PROMOTION, REDUCTION, OR ELIMINATION	567	94	11	33	50

(27) This line indicates the headings for all the organizational and biographical items for which reports can be produced. These items are as follows:

(a) Type of organizational table to which respondents belong-TOE (Table of Organization and Equipment) or TDA (Table of Distribution and Allowance).

(b) TOE, TDA, MTO, or MTD number.

(c) Location by paragraph number of incumbent's position within organizational table.

(d) Location by line number of incumbent's position within organizational table.

(e) Location by country of incumbent's position. These are indicated as follows:

Country	Code
1. United States (except Hawaii & Alaska)	US
2. Hawaii	HW
3. Alaska	AK
4. Panama Canal Zone	PZ
5. Germany	GY
6. Italy	IT
7. Republic of Vietnam	VS
8. Republic of Korea	KS
9. Japan	JA
10. Okinawa	RK

(f) Total time in present duty position as follows:

	Code
1. Less than 6 months	1
2. 6 months to 2 years	2
3. 2 years to 5 years	3
4. Over 5 years	4

(g) Four-character duty position code.

(h) Pay grade authorized for present actual duty position.

(i) NCO/Specialist status authorized

(j) Actual pay grade

(k) Length of service in Army:

	Code
1. Less than 1 year	1
2. 1 year to 4 years	2
3. 4 years to 7 years	3
4. 7 years to 10 years	4
5. 10 years to 15 years	5
6. 15 years to 20 years	6
7. Over 20 years	7

(l) Highest level of civilian education completed (including GED credit)

	Code
1. Fourth grade	1
2. Eighth grade	2
3. High School	3
4. 1 year college	4
5. 2 year college	5
6. 4 year college	6
7. Graduate Degree	7

(m) Source or Sources of training for present duty position:

	Code
1. On-the-job Training	A digit 1 in the first through sixth positions indicates presence of item; 0 indicates its absence.
2. Advanced Individual Training	
3. CONUS School	
4. Command or unit sponsored school	
5. Contractor training	
6. Civil schooling	

(n) Actual NCO/Specialist status

(o) Primary MOS Code

(p) Fourth digit (skill level) of duty MOS

(28) A digit 5 beneath DYMOS signifies that this particular report represents all the MOS 11G Infantry Senior Sergeants responding in the survey with a fourth digit (skill level) of 5.

Format of Skill Level BUD (Task Statement Section)

FIGURE 14

MOS 05B (RADIO OPERATOR)

TASK COMPARISON BY DUTY POSITION

TASKS: TRANSMIT/RECEIVE MESSAGES BY CW

DY POS	% TRANSMIT	% RECEIVE
INTERMEDIATE SPEED RADIO OPER	44	45
CHIEF RADIO OPERATOR	87	86
RADIO OPERATOR SUPERVISOR	95	94

FIGURE 15

IDENTIFICATION OF COMMON TASKS

MOS 74A (DPE OPERATOR) AND MOS 74D (MA SPECIALIST)

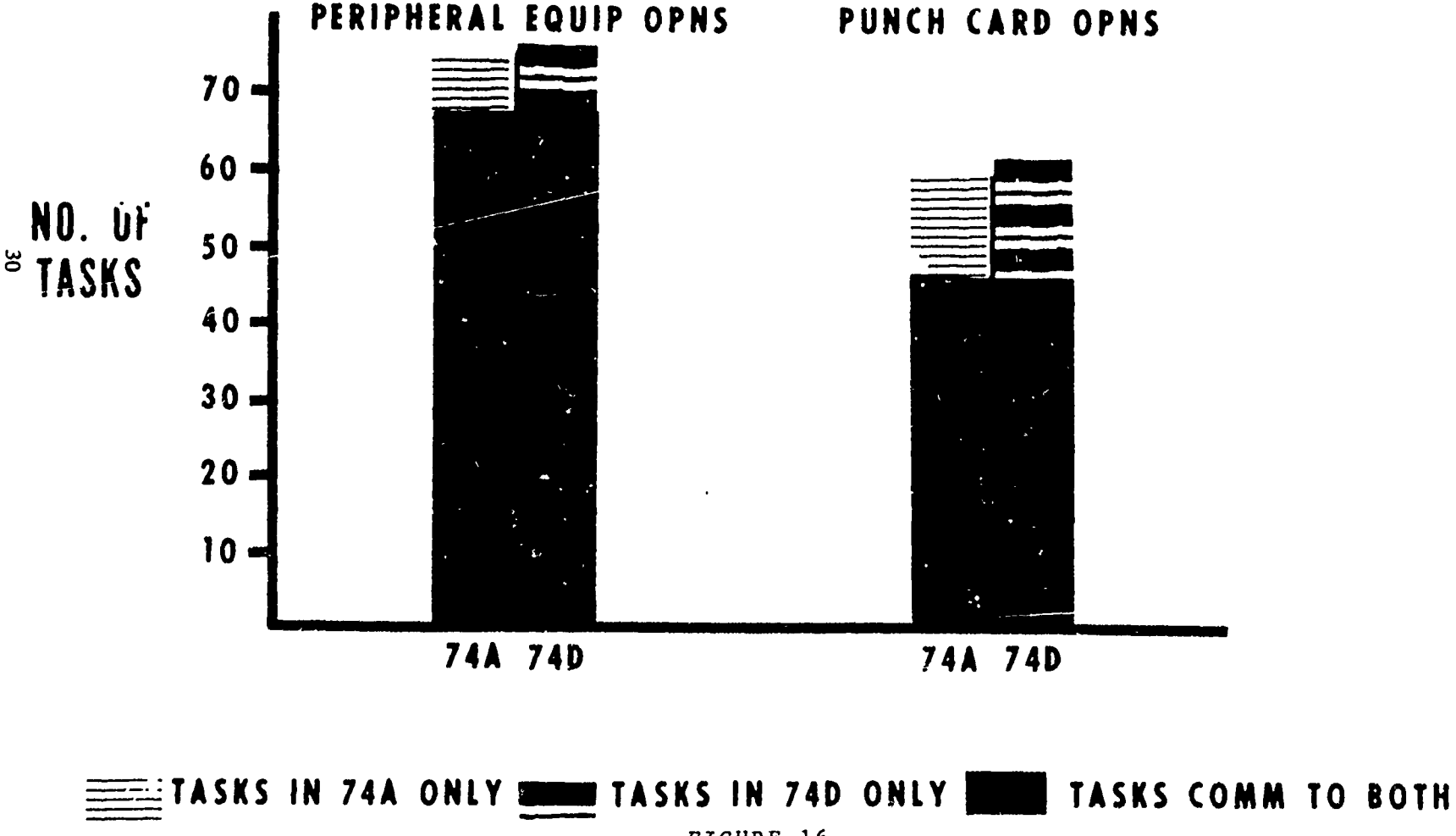

FIGURE 16

PERCENT REQUIRING SECURITY CLEARANCE

CAREER GROUP 74 (DATA PROCESSING)

CLEARANCE	74A	74B	74C	74D	74E	74F
TOP SECRET	16%	4%	7%	5%	7%	5%
SECRET	50%	30%	58%	40%	70%	54%

FIGURE 17

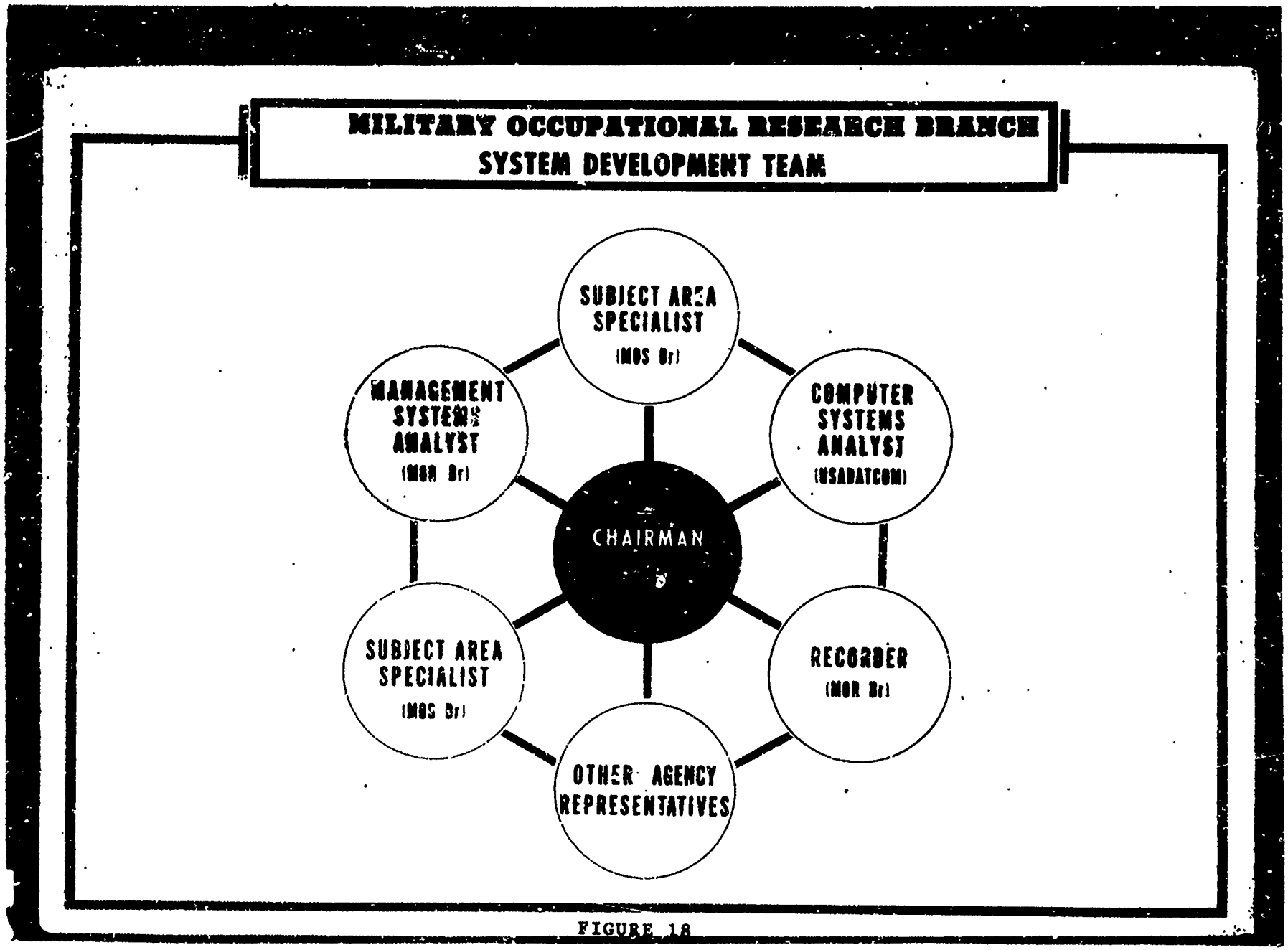
MILITARY OCCUPATIONAL RESEARCH BRANCH
SYSTEM DEVELOPMENT TEAM
SUBJECT AREA SPECIALIST (MOS Br)
MANAGEMENT SYSTEMS ANALYST (MOR Br)
COMPUTER SYSTEMS ANALYST (USADATCOM)
CHAIRMAN
SUBJECT AREA SPECIALIST (MOS Br)
RECORDER (MOR Br)
OTHER AGENCY REPRESENTATIVES

FIGURE 18

JOB ANALYSIS IN THE UNITED STATES TRAINING AND EMPLOYMENT SERVICE

By

Leon Lewis
Assistant Chief
Division of Occupational Analysis
and Career Information, USTES
United States Department of Labor

Job Analysis: What It Is

Information concerning jobs and their tasks and requirements is the basic data used by industry, government, private agencies, and employee organizations in their manpower programs. The specificity and nature of this information varies according to program needs. Regardless of the ultimate use for which it is intended, however, it must be accurate, omit nothing pertinent to the needs, and be presented in the form most suitable for its purpose. The techniques and procedures for collecting and presenting these data are known as "job analysis."

Job Analysis in USTES

In the United States Training and Employment Service, job analysis is defined as the activity involved with determining what the worker does in relation to Data, People, and Things; the methodologies and techniques employed; the materials, products, subject matter, and services involved; machines, tools, equipment, and work aids used, and the traits required of the worker for satisfactory performance.

Public Employment Service Established

"With the passage of the Wagner-Peyser Act in June 1933, there came into being an Employment Service requiring the registration of individuals in the working population according to their occupational characteristics on a scale unprecedented in the history of the country and probably in the history of the world. The Act provided for the development of the present nation-wide public employment service through the creation of the United States Employment Service and the establishment of the temporary National Re-employment Service.

"From a broad point of view, the responsibilities imposed upon the public employment system by the Wagner-Peyser Act have as their objective: (a) the facilitation of the movement of unemployed persons into profitable employment; (b) the provision of occupational guidance to individuals seeking a vocational field and to employers having special recruitment problems; and (c) reduction of the waste of trial and error recruitment through taking into account, first, the worker qualifications that are necessary to successful job performance and, second, recruiting relationships between occupations."[1]

Need For Occupational Information

It soon became apparent that in order for such a nation-wide employment service to carry out these missions, there was a specific and urgent need for a comprehensive body of occupational information which could be used as basic reference and operational data. To answer this need, the Occupational Research Program of the United States Employment Service was initiated.

Occupational Research Program Initiated

A group of individuals with wide experience in personnel and occupational research work in industrial, governmental, and educational institutions were invited to act in an advisory capacity to this new program. This group was designated as the Technical Board for the Occupational Research Program of the United States Employment Service. From their experiences in the field of occupational analysis and the development of selection techniques, the members of the Board felt that two broad principles should govern the planning of such a project:

[1] The Occupational Research Program of the United States Employment Service; William H. Stead and W. Earl Masincup, Public Administration, 1942.

1. The Program should provide for an initial period of very extensive gathering and processing of data to provide an over-all picture of the occupations that exist in the American economy together with a standarized concept of the nature of each occupation.

2. All data should be gathered from original sources through the observation of workers in the working environment in order to reflect occupational facts as they exist rather than to build up an academic statement of an ideal occupational structure

Job Analysis Methodology Evolved

In the initial stages of the Program, techniques were developed for identifying and describing occupational analysis information significant in bringing together a person and a job. These techniques evolved into a "job analysis methodology," which was presented in a series of instructional manuals for internal use over approximately a ten-year period. Finally, in 1944 a basic *Training and Reference Manual for Job Analysis* was published. From that date, this manual and its revision in 1965 have served as a basic guide for the collection and recording of source data fundamental to the development of occupational analysis information and the tools based upon it.

Job Analysis in the 1930's

The job analysis techniques developed during this period reflected the job market situation of the times, that of a surplus of qualified workers and a shortage of jobs. Consequently, the data collected emphasized the tasks (the what, how, and why of the job) and placed little emphasis on the characteristics required of the worker. On the standard Job Analysis Schedule, the form for recording the data, only three items – experience, training, and performance requirements (responsibilities; job knowledge; mental application; and dexterity and accuracy) – referred to the qualifications a worker must bring to the job.

Changes in Techniques to Suit Job Market Changes

By the 1940's the economy, including the job market, had radically changed: rather than the surplus of qualified workers of the Depression years, there now was a scarcity of workers, and a surplus of jobs needing to be filled, which demanded a change in hiring practices. The urgency was for recruiting for defense jobs. Highly selective recruitment on the basis of experience had passed out of the picture: acceptance of inexperienced workers with potential for the jobs became a common practice.

Emphasis on Traits of Entry Worker

In order to utilize every available manpower source, it became increasingly important for recruitment and placement personnel to be provided with estimates of the characteristics or traits which the applicant should possess in order to learn to perform the job. With the not fully qualified (entry) worker becoming important as a manpower resource, the necessity arose for a system of evaluating jobs and workers' potential on the basis of traits requirements.

Worker Characteristics Analysis

The first attempt to meet this need was the expansion of the Job Analysis Schedule to include two attachments: (a) a form for recording the Physical Demands of jobs and (b) a Worker Characteristics Form for recording the "personal traits" required of the worker. Each job analyzed was analyzed in terms of significant items on these two attachments, as well as those on the schedule itself.

Personal Traits in Part IV of DOT

The next attempt to provide Worker Traits information appeared in Part IV of the *Dictionary of Occupational Titles*, 1944. This document was entitled "Entry Occupational Classification," and was developed for use in counseling and placing entry workers. Part IV defined entry workers as "individuals who must find employment on some basis other than prior work experience or fully qualifying training." More specifically, they are those individuals who are not fully qualified to compete with experienced applicants for referral to specific occupations; and those who are fully qualified in a specific occupation but who must or wish to enter some field of work in which they do not have competency.

This document contained groups of jobs which had been analyzed and were described in terms of "personal traits," examples of which were: ability to relate abstract ideas; ability to plan; memory for detail; facility with language; dexterity and muscular control; persuasiveness; liking for people. etc.

Functional Occupational Classification Project

The information in Part IV proved so useful that in 1949 a project was initiated for the development of a new classification system for jobs that would reflect all significant facts about a job – particularly the two basics – what the worker does and the requirements made on him. One of the first steps was to categorize, define and standardize traits required of the worker, and to provide manualized techniques and instructions for determining Work Performed and Worker Traits requirements. This activity became known as the Functional Occupational Classification Project. A later stage of the Project included the application of concepts and procedures in the manuals to the analysis of a selective sample of 4,000 jobs. Some of the resulting data were released in our publication, *Estimates of Worker Traits Requirements for 4,000 Jobs as Defined in the Dictionary of Occupational Titles,* 1956. This work was helpful in the research and development of the occupational classification structure for the third edition of the *Dictionary of Occupational Titles.*

[2]*The Manual for Analyzing Jobs,* containing this new methodology is expected to be published and released late in 1969.

New Approach to Job Analysis

The Functional Occupational Classification Project also provided the data upon which to base a new methodology for job analysis. For the past ten years this methodology has been used experimentally in the Occupational Analysis Field Centers and Occupational Analysis Special Projects that are located in various parts of the country and function under the direction of State Employment Security agencies with technical direction from the Division of Occupational Analysis and Career Information in the Manpower Administration. One of the basic missions of these Centers and Special Projects is to collect current job analysis data for all jobs in the economy, and the application of this "new" methodology in this activity has provided for structuring the collection of the data as well as expanding the information on all facts of a job make-up. At present there are five categories of information that must be obtained in order to meet the requirements for a complete analysis of a job: a) Worker Functions, b) Work Fields, c) Machines, Tools, Equipment, and Work Aids, d) Materials, Products, Subject Matter, and Services, and e) Worker Traits.[2]

Worker Function

All jobs involve a relationship to Data, People, and Things in some degree. These relationships are expressed by 24 Worker Functions, and a combination of the highest functions which the worker performs in relation to Data, People, and Things expresses the total level of complexity of the job.

STRUCTURE OF WORKER FUNCTIONS

DATA	PEOPLE	THINGS
0 Synthesizing	0 Mentoring	0 Setting-Up
1 Coordinating	1 Negotiating	1 Precision Working
2 Analyzing	2 Instructing	2 Operating-Controlling
3 Compiling	3 Supervising	3 Driving-Operating
4 Computing	4 Diverting	4 Manipulating
5 Copying	5 Persuading	5 Tending
6 Comparing	6 Speaking-Signalling	6 Feeding-Offbearing
	7 Serving	7 Handling
	8 Taking Instructions-Helping	

Note: The hyphenated factors Speaking-Signalling, Taking Instructions-Helping, Setting-Up, Operating-Controlling, Driving-Operating, and Feeding-Offbearing are single functions.

Work Fields

Work Fields are organizations of specific methods either (a) characteristics of machines, tools, equipment, or work aids, and directed at common technological objectives, or (b) characteristic of the techniques designed to fulfill socio-economic purposes. There are 99 Work Fields which have been organized for purposes of classifying all the jobs. Work Fields range from the specific to the general, from such relatively simple complexes as Drafting, Riveting, and Sawing to highly involved complexes as Structural Fabricating-Installing-Repairing. The more general Work Fields are defined wherever possible in terms of the simpler ones that are specific to them. For example, Structural Fabricating Installing Repairing is defined as a Work Field which includes combinations of Work Field as Abrading, Nailing, Riveting, Welding, etc. Frequently a job involves techniques specific to a number of work fields but should be characterized in terms of primary involvement. For example, a job of mixing ingredients which may also include weighing materials would be identified by the Work Field of Mixing. and the Work Field Weighing would be a subsidiary work field. Prefixes such as *un* or *re* are implicit in the definition of a Work Field. *Loading-Moving* include unloading and removing. *Packing* includes unpacking, etc. The Work Fields have been organized into groupings, shown in Work Fields Organization, more or less similar technologically or socio-economically in overall objectives, that is, the getting of materials and making of products, the processing of information, and the providing of services. Following is an analysis of a Work Field.

Riveting

Fastens together parts by fitting a heated, malleable bolt, pin, or rod through previously bored holes and then hammering or pressing the shank end to form another head. Distinguish from fastening paper or similar light materials with paper "rivets," eyelets, grommets, or the like *(Folding-Fastening.)*

Method Verbs: Bucking; Dimpling; Hammering; Striking; Clinching; Driving; Squeezing

These are examples of verbs which are used to refer to the specific methods of performing the work. In other words, they tell how the objectives of a Work Field are accomplished. They relate to the technological elements exclusive of materials, etc., around which the "know how" of the Work Field exists. They are not separately defined. Some of these words may occur in several other Work Fields and may have somewhat different meanings in each.

Machines: Dimpling; Hydraulic Riveting Machine; Riveting Machine; Riveting.

Tools: Dimpling Gun; Hammers; Punches; Rivet Gun; Rivet Set; Rivet Squeezer; Riveter, Hand; Riveter, Power; Tongs.

Equipment:

Work Aids: Anvils; Charts; Diagrams; Dies; Fixtures; Jigs; Manuals; Rivets; Vise.

Machines, Tools, Equipment, and Work Aids

These are the examples of the instruments and devices which are used to carry out the specific methods. They are most directly related to the Methods Verbs and help to describe them. The following definitions are used for the separate parts of this category.

Machines: Devices which are a combination of mechanical parts with the framework and fastenings to support and connect them, designed to apply a force to do work on or move material or to process data. A machine may be activated by hand or foot power applied through levers or treadles, or by any outside power source, such as electricity, steam, or compressed air. Included in this category are printing presses, drill presses, casting machines, forging machines, conveyors, hoists, locomotives, automobiles, adding machines, and typewriters.

Tools: Devices which are manipulated to do work on or move material. Consists basically of all

common handtools but also included are implements manipulated by the worker and motivated by outside power sources, such as electricity or compressed air. Example of the latter are pneumatic hammers, cutting torches, paint-spray guns, electric screwdrivers, and electric cutters.

Equipment: Devices which generate power, communicate signals, or have an effect upon material through the application of light, heat, electricity, steam, or atmospheric pressure – such as ovens, stills, forges, cameras, and power-generating devices. Also included in this category are nonprocessing devices, such as P.B.X. switchboards, radio transmitters, weight scales, ammeters, and signal-light systems.

Work Aids: Miscellaneous items which cannot be considered as machines, tools, or equipment, and yet are necessary for carrying out the work. Included are (a) Jigs and fixtures, covering such work supports as vises, anvils, drill-jigs, assembly fixtures, holding fixtures, and clamps, usually used to secure the work piece in place for future operations; (b) Special measuring devices, such as micrometers, calipers, gages, rules, squares, tapes, and the like, which are manipulated by hand; (c) Graphic instructions, including drawings of any kind (blueprints, sketches, maps, charts, wiring diagrams) and formalized job directions such as manuals; (d) Substances which are used in the fabrication or processing of Materials or Products such as glue and paint; (e) Musical instruments.

Materials, Products, Subject Matter, and Services

Materials, Products, Subject Matter, and Services include (a) basic materials being processed, such as fabric, metal, or wood; (b) final products being made, such as automobiles and baskets; (c) knowledge being dealt with or applied, such as insurance or physics; (d) types of services, such as barbering or dental services.

In organization and content the component consists of a list of categories derived from the Commodities Index of the Standard Industrial Classification Manual and from educational classifications or subject matter fields. Categories of tangibles are those which cover materials and products. Examples are LUMBER AND WOOD PRODUCTS and FIELD CROPS. Categories of intangibles are those involving specialized knowledges which cannot be expressed by listing a material or product, such as BUSINESS SERVICES AND ADMINISTRATION and METEOROLOGY.

The 580 categories are organized into 55 major groupings. The code grouping for this component consists of three digit codes. The first two digits designate the major groupings. The third digit applies to the specific categories included in that group. Codes ending in 0 designate the most general form or multiple combinations of the categories in the group. Codes ending in 9 apply to specific Not Elsewhere Classifications (n.e.c.) categories appropriate for that group.

Worker Traits

The requirements made on the worker are expressed by Worker Traits factors. These are reflected in the following components: a) Training Time, b) Aptitudes, c) Temperaments, d) Interests, and e) Physical Demands. This body of job information provides a sharper focus on the type of work involved and the trait demands made on the individual worker concerned, and is extremely helpful in Counseling, job development, training and other activities directed toward full manpower utilization. Following are the definitions of the Worker Trait Components:

Training Time: Training Time is a combination of general educational development and specific vocational preparation required for a worker to acquire the knowledge and abilities necessary for average satisfactory performance in a specific job.

> **General Educational Development:** This embraces those aspects of education (formal and informal) which contribute to the worker's: a) reasoning development and ability to follow instructions, and b) acquisition of "tool" knowledge such as language and mathematical skills.
>
> **Specific Vocational Preparation:** This is the amount of learning time specifically directed at a definite vocational goal. This training may be acquired in a school, work, military, institutional, or avocational environment.

Aptitudes: Aptitudes are the specific capacities or abilities required of an individual in order to facilitate the learning of some task or job duty. Following are the aptitudes used: a) Intelligence, b) Verbal, c) Numerical, d) Spatial, e)

Form Perception, f) Clerical Perception, g) Motor Coordination, h) Finger Dexterity, i) Manual Dexterity, j) Eye-Hand-Foot Coordination, k) Color Discrimination.

Temperaments: Since "temperament" has a wide range of meaning, this range has been limited to: "Those personality qualities which remain fairly constant and reveal a person's intrinsic nature." In collecting job data, these traits are evaluated in terms of job situations that require the worker to possess certain temperament qualities or to be able to adjust to tests that require them. This consists of adjustment to situations involving:

1. Variety of duties often characterized by frequent change.
2. Repetitive or short cycle operations carried out according to set procedures or sequences.
3. Doing things only under specific instructions, allowing little or no room for independent action or judgement in working out job problems.
4. Direction, control and planning of an entire activity of others.
5. Dealing with people in actual job duties beyond giving and receiving instructions.
6. Working alone and apart in physical isolation from others, although activity may be integrated with that of others.
7. Situations involving influencing people in their opinions, attitudes, or judgements about ideas or things.
8. Performing adequately under stress when confronted with the critical or unexpected or taking risks.
9. Evaluation (of information, generalizations, value or decisions) against sensory and/or judgmental criteria.
0. The evaluation (of information, generalizations, standards, or decisions) against measurable and/or verifiable criteria.
X. Interpretation of feelings, ideas, or facts in terms of personal viewpoint.
Y. Precise attainment of set limits, tolerances, or standards.

Interests: "An interest is a tendency to become absorbed in an experience and to continue it, while an aversion is a tendency to turn away from it to something else," says Walter V. Bingham.[3] The factors of this component are concerned with situations involving a preference for activities dealing with, concerned with, involving, or of:

1. dealing with things and objects *vs.* People and the communication of ideas
2. business contacts with people *vs.* scientific and technical nature
3. routine, concrete, organized nature *vs.* abstract and creative nature
4. working for people for their presumed good as in the social welfare sense or for dealing with people and language in social situations *vs.* Nonsocial in nature and are carried on in relation to processes, machines, and techniques
5. Prestige or esteem of others *vs.* Tangible, productive satisfaction

Physical Demands: Physical Demands Analysis is concerned with the physical requirements made on a worker by the job, rather than the physical capacities which the worker may possess. These physical demands are made up of (a) the Physical Activities which the job requires, and (b) the Environmental Conditions under which the job is performed. This consists of the following six Physical Activities factors and the seven Environmental Conditions:

Physical Activities Factors

1. Strength
   a. Lifting, Carrying, Pushing and/or Pulling
   b. Sedentary, Light, Medium, Heavy, Very Heavy
2. Clumbing and/or Balancing
3. Stooping, Kneeling, Crouching and/or Feeling
4. Reaching, Handling, Fingering and/or Feeling
5. Talking and/or Hearing
6. Seeing

Environmental Conditions Factors

1. Work Location
2. Extreme Cold With or Without Temperature Changes
3. Extreme Heat with or Without Temperature Changes
4. Wet and/or Humid
5. Noise and/or Vibration
6. Hazards
7. Atmospheric Conditions

[3] Bingham, W. A., Aptitudes and Aptitude Testing.

Job Analysis Importance in Manpower Programs

Job Analysis has contributed to many important activities in the manpower field, including: *Provision of Employment Service Tools, References and Other Occupational Literature.*

Beginning back in the early 1930's with the Occupational Research Program and continuing into the present, job analysis studies have provided the data for such publications as the *Dictionary of Occupational Titles*, Industry Job Descriptions, Occupational Guides, Interviewing Aids, Job Families, the Entry Occupational Classification (Part IV of the *Dictionary of Occupational Titles*), Job Descriptions and Organizational Analysis for Hospitals and Related Health Services, the Career Guide for Demand Occupations, the Health Careers Guidebook, and Occupations in Library Science. These are only a few of many such publications that have provided timely and meaningful occupational analysis data, and have proved especially useful to counseling, recruitment and placement personnel for bringing together individuals and employment opportunities.

Three editions (1939, 1949, 1965) of the *Dictionary of Occupational Titles* have now been published, each a considerable revision and expansion of the former. The present third edition defines about 22,000 jobs in the American economy, classifies them in terms of a 6-digit code, and provides a wealth of information for use in activities concerned with the entry worker.

Recruitment and Placement

Job analysis is used to identify job requirements and the specific qualities required of workers to fill jobs. Recruitment and placement officers, both in industrial personnel offices and in the public employment service, thus can be guided in bringing together the worker and the job. Without information revealed in job analysis products, such as the *Dictionary of Occupational Titles*, job descriptions, and interviewing aids, intelligent interviewing is difficult and accurate placement, a matter of chance. Detailed information about jobs places recruitment and placement on an objective basis.

Vocational Counseling

The products of job analysis furnish the vocational counselor with accurate pictures of the tasks and requirements of jobs and of the avocations, training, and experiences that lead to them. If occupational adjustment is to continue to be a significant factor in the solution of worker problems, the counselor must be provided with accurate and adequate information about jobs on which he can base his advice to workers, especially youth, the physically and mentally handicapped, and the inexperienced. Such information can come only through job analysis.

Job and Employee Evaluation

Job analysis provides the occupational data required for developing an objective method for evaluating employee performance on the job. It permits relating the qualifications and abilities demonstrated by the worker to occupational factors and demands in order to show properly employee performance. Lacking such objective measures, the rating official is reduced to mere guess in determining the degree of skill possessed by a worker. Similarly, jobs must be evaluated objectively in order to assure equitable salary and wage rates and to maintain orderly and economic operation. Objective evaluation of jobs requires careful analyses of the relative degrees of skill or difficulty of the jobs. Job analysis alone can supply the data needed.

Safety, Health and Medical Research

Safety engineering utilizes job analysis to locate potential sources of occupational hazards and to develop safety procedures for eliminating the hazards. Here, as in other fields in which job analysis is used, an analysis of causative conditions is fundamental to remedial action. Occupational diseases and fatigue can be traced to the nature of the job and its surroundings. Similarly, occupational data regarding physical requirements provide medical departments with information required to decide whether or not a disabled employee or a person possessing physical limitations can perform the duties of a job. In addition, knowledge of the nature of tasks is essential to determine their suitability for occupational therapy and related needs.

Labor Relations; Within-Plant Personnel Policies

Clear statements of duties and responsibilities of all jobs in an organization result from job analysis. Such statements are the factual bases upon which workers and management can achieve a common understanding. They assist in adjusting grievances arising from such factors as performance and responsibility, and they define

the limits of authority essential to productive working relationships. They define and outline promotional steps and thereby become factors essential to good morale.

Under these broad general programs are many specific applications of job analysis, such as the determination of the content of vocational courses, determination of occupations suitable for women, and the determination of limits of authority. From an examination of any of them, it is apparent that their success is dependent largely upon the completeness and accuracy of the facts with which they deal, many of which are obtained only by job analysis. To assure this, the task of the job analyst is to get the facts, get them accurately, and get them all.

Better Utilization of Workers

This activity relates to both worker mobility and worker potential. Analysis of the functions and worker traits requirements, especially Aptitudes and Training Time, can establish job relationships useful in the transfer and promotion of workers, and facilitate developing and providing job opportunities at the entry level. By identifying actual physical demands, for example, job analysis has facilitated the utilization of the handicapped worker. A supplement to the DOT, *Selected Characteristics of Occupations (Physical Demands, Working Conditions, Training Time)* has been particularly valuable for this purpose.

Development of Training and Testing Programs

During the past decade, growing and major emphasis has been placed on the need for developing the potential of the disadvantaged and opening up large numbers of entry jobs which include career lattices. Job analysis has largely contributed the basic source data used by vocational curriculum developers and test development specialists. With the use of job analysis data, meaningful training programs such as the in-step, and on-the-job training envisioned in the career lattice concept have been established and specialized testing and training can be designed for the mentally retarded, handicapped, or disadvantaged.

Job Restructuring

Probably the most innovative and useful methodology developed through job analysis techniques in recent times, job restructuring accomplishes the identification of jobs within the system of which they are a part; and the redesign, combination, or otherwise alteration of the distribution of tasks with the job, or among the jobs in the system, according to the specific of each task in terms of its relationship to Data, People, and Things, and the level at which the worker functions in each; General Educational Development requirements; and Aptitudes and other Worker Traits significant in job performance. As a final step in this procedure, the tasks are evaluated and reallocated on the basis of these data.

The purposes for which the job restructuring methodology can be applied are almost as limitless as the number of ways in which tasks can be reallocated; for example, it provides the basic data necessary to: a) redesign jobs to meet the demands of new and changing technologies; b) alleviate skill shortages, c) create meaningful "career lattices," provide opportunities for horizontal (transfer), vertical (promotion), and diagonal (promotion and/or transfer) lines of worker mobility; d) establish initial training and subsequent in-step training requirements to make possible these lines of mobility; e) "streamline" an organization for the most efficient and economical use of workers and f) develop jobs and opportunities for the disadvantaged (the un- or under-educated, the handicapped, the older worker, and other special groups which have heretofore been left out of the mainstream of employment opportunities).

Continuing Role of Job Analysis

Over the years, job analysis has proved to be a significant factor in resolving many kinds of manpower problems. As the economy has changed, the occupational and job analyst has found his services facing expanding and changing demands.

The Past, The Present, The Future

As we have seen, the job analysis concepts and procedures established during the Occupational Research Program of 30 years ago have been developed into a highly sophisticated methodology to meet the demands of the present. Yet the two basic principles previously mentioned for the Occupational Research Program in 1933 are in many respects part of the mission of the Division of Occupational Analysis and Career Information in 1969. The changes that have taken place were in the methods for compiling the data,

which have become more structured and comprehensive and the ultimate uses of the data. At present, the USTES job analysis methodology is believed to be one of the most complete and meaningful methods for collecting and systematizing occupational analysis information yet developed. Probably its most significant and valuable contribution is the information collected and recorded through the medium of the Work Performed and Worker Traits concepts. In the future research in this field will continue, and when the demands of the economy change, the job analysis methodology will be revised to accommodate new needs.

COLLECTING, ANALYZING, AND REPORTING INFORMATION DESCRIBING JOBS IN THE UNITED STATES AIR FORCE

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I. INTRODUCTION

There has long been an important military requirement to obtain information regarding jobs as they are actually performed in the field. In 1952, Rupe investigated five methods of job analysis in order to meet this requirement. The methods investigated included: (a) the individual interview in which a job analyst interviews incumbents individually away from the job site; (b) the observation interview in which the analyst interviews the incumbent both on and off the job, observing significant portions of the work and asking questions about work activities; (c) the group interview in which information about the job is obtained from groups of incumbents who complete schedule forms under the general supervision of the job analyst; (d) the technical conference of job experts held under the leadership of an analyst who obtains detailed information regarding job activities, and (e) the questionnaire-survey by mail which requires incumbents to describe their jobs by completing an elaborate questionnaire form.

Another method, the critical incident technique had been proposed by Flanagan (1954) and his associates who maintained that the determination of critical incidents should be the principal objective of the job analysis procedure. This method was tried out but later abandoned by the Army. Smith and Staudohar (1955) in an attempt to determine requirements for basic training of tactical instructors in the Air Force collected 6,615 usable critical incidents. Until 1961, however, the official Air Force job analysis procedure was a combination of group interview and technical conference methods.

Among various drawbacks such as expense, need for professional job analysts, time consumption, inadequacy of samples, and others that could be mentioned, the most glaring deficiency of all of the methods is that the data are obtained in non-quantifiable form. The derived job information is not amenable to statistical analysis. As long as this state of affairs existed, job analysis could not get off dead-center and in many cases after voluminous occupational data had been collected, no one knew what to do with it.

On the basis of his comparisons, Rupe (1956) pointed out serious deficiencies in all of the methods for use under operational conditions in the Air Force. As an alternative, he concluded that a check-list survey method of job analysis should be considered as a possible procedure for fulfilling Air Force needs.

Procedures, other than those mentioned, such as automatic data collection plans, daily work diaries, supervisor-incumbent conferences, open-ended questionnaires, card-sorting techniques, and work participation schemes, were also studied for potential Air Force adoption. While some of these techniques held promise for local use they were deemed unsatisfactory for Air Force-wide surveys. All of the preliminary investigations and inquiries indicated that some kind of job inventory survey procedure offered the greatest probability of satisfying Air Force requirements.

The Air Force agencies which use job information were catalogued and in each instance the purposes to be served by the job data were analyzed. Finally, a set of specifications were drawn up which were to be met by an operational job analysis procedure which would best serve a multiplicity of Air Force needs. The job inventory permits large, world-wide samples to be surveyed in a short period of time. The method is economical. It produces quantifiable data which can be stored, analyzed, and reported by computer. The job information obtained is not only amenable to research, but can be tailored to answer specific operational questions.

II. THE JOB INVENTORY SURVEY PROCEDURE

The job analysis method finally developed for the Air Force combines features of the check

list with those of the questionnaire and the technical conference. Using information derived from job descriptions, job training standards, or other published sources, a preliminary task inventory is constructed according to a standardized format. Subject matter experts act as consultants in the early stages of development to insure completeness of coverage and accepted use of terminology. The resulting instrument usually consists of from 200 to 400 task statements grouped under major work activities called duties. An inventory is constructed not for a particular position or specialty, but for an entire promotion or career ladder. Thus an airman job inventory will include work done at the apprentice, journeyman, supervisor, and superintendent levels, since an incumbent may perform tasks which are above or below his skill level. An officer inventory will similarly include tasks of entry level, line, field, and staff officer grades. In some instances, where it is suspected that incumbents may perform tasks outside their designated ladder, several career ladders are combined so that a single survey instrument may cover tasks over a broad career field. Job inventories can be most readily constructed in those specialties which have long existing civilian counterparts, such as security police, medical laboratory, or dental technician. Tasks and duties in such areas have become standardized and published source materials are comprehensive and consistent. Inventory construction is most difficult for jobs in the new, complex, and rapidly changing fields, such as electronics, or armament systems.

A thorough field review is essential before using an inventory in an operational survey. The preliminary inventory is submitted to as many as 100 or more experienced incumbents at installations in several commands. Task statements judged to be inadequate are modified or deleted and new duties and tasks are added. The review information is then considered in the construction of the final operational form.

The revised job inventory is administered by mail to large samples of job incumbents who provide certain background information and respond to the task statements. Great care is taken in selecting representative samples. In specialties with large numbers of incumbents, a 10 to 50 per cent random sample may be sufficient. When the total number of incumbents in a specialty is small an attempt is made to survey all incumbents. For surveying airman jobs, group administration in base testing rooms is carried out by personnel trained to administer tests. Officer inventories are self-administered with all instructions contained in the booklets.

In completing the inventory, the incumbent provides identification, background, and other job-related information. He then checks the tasks he performs. Beginning each task statement with an action word and then arranging the tasks alphabetically under duty categories facilitates recall of work done. The inventory identifies the work activities for the non-verbal individual who might have difficulty in writing down or telling a job analyst the many things he does.

The incumbent then goes through the inventory again, and rates each task he performs on a relative time spent scale. That is, he compares each task he does with all other tasks in his job. This time-spent rating is a fundamental feature of the Air Force job analysis procedure. The incumbent is usually asked also to rate each task he does on some other factor such as difficulty, criticality, training need, supervision received, or experience in performance.

Incumbents are directed to add tasks that are not listed. The fact that incumbents supply missing tasks which are incorporated into subsequent revisions, and fail to respond to obsolete tasks makes the inventory a dynamic, self-correcting instrument for obtaining current job information. In the past the compilation of such written-in information with consolidated job descriptions was a difficult and time consuming process. Collation of added tasks is now simplified because statements tend to be written at the same specificity level as tasks already listed and are categorized by incumbents under the major functions of their jobs. The more complete the inventory, the fewer are the tasks written in.

Completed inventories are returned to a central location, where the data are key punched and transferred to magnetic tape in readiness for computer analysis.

Quality of Job Inventory Survey Information

A number of studies have been carried out in an effort to estimate the reliability of job inventory data. Interest has centered on internal consistency and test-retest reliability, although other measures of reliability have been used. The ultimate measure of validity of job inventory data is the correspondence between reported task information and actual performance on the job. Obtaining criterion data by direct observation is not entirely satisfactory since many tasks may be performed which can be seen only partially or not at all by an observer; furthermore, the presence of the observer may influence task performance. If a

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Seventy-Seventh Annual Convention of The American Psychological Association. *Proceedings of 19. Division of Military Psychology Symposium: Collecting, Analyzing, and Reporting Information Describing Jobs and Occupations.* Lackland AFB, Tex.: Personnel Research Division, Air Force Human Resource Laboratory. September 1969.

Add to line 44, page 82, the following: X_1 = Average difficulty level of tasks performed, per unit time;

44 W

large proportion of incumbents respond to a task statement in the same way, a kind of validation has been obtained. The alternative possibility of consistent error in reporting seems highly unlikely. Results of research to determine the quality of job information obtained may be summarized as follows:

1. If a job incumbent completes an inventory on two occasions, he will give essentially the same information both times.

2. Supervisors agree to the reasonableness of information provided by their subordinates.

3. Job information obtained by using more time-consuming daily work records agrees in general with information gathered by means of inventories.

4. When tasks known not to be done are included in an inventory, they are not checked by incumbents.

5. When a task is slightly reworded and both versons are listed in the same inventory, incumbents tend to respond to the two versions in the same way.

6. Low skill level incumbents rarely indicate performance of high skill level tasks.

7. When supervisors and subordinates independently complete inventories describing the subordinates' jobs, there are sometimes discrepancies because supervisors may not know in detail how their subordinates spend their work time. There is no tendency, however, on the part of subordinates to exaggerate either the number or difficulty level of tasks performed.

8. Job inventories for the same officer utilization field were constructed and administered by two independent teams. For all practical purposes the job information produced by these two efforts was identical.

9. The analysis of some 17,000 cases in 50 career ladders shows reliabilities in the high 90's both for percentage of incumbents performing tasks and for percentage of work time spent on them.

III. COMPUTER ANALYSIS OF OCCUPATIONAL SURVEY DATA

The combination of quantitative occupational survey data with highly sophisticated computer programs and an elaborate storage and retrieval system provides the most powerful tool yet devised for the analysis of jobs.

Individual Job Descriptions

In filling out the inventory, the incumbent first completes the background information section. He gives his name, grade, social security account number, organization, and command. He also responds to other items such as, months in career field, months in present work assignment, total months active federal military service, and education level. He may be asked to indicate courses he has had, equipment he has worked on, and whether or not he plans to reenlist, or finds his job interesting, or thinks his job utilizes his talents and training.

The incumbent then checks the tasks he performs as part of his regular job. He rates the tasks he has checked, as mentioned earlier, usually on a 7-point relative time spent scale. If he spends very little time on a task compared with other tasks he performs he enters a rating of 1. A rating of 7 indicates that he spends a great deal of time on a task.

Since the inventory covers the tasks in an entire career ladder and the incumbent has been instructed to rate all the tasks he performs, it may be assumed that the total of an incumbent's time spent entries represent 100 per cent of his time on the job. The computer has been programmed to convert each incumbent's relative time spent ratings to per cent time spent by summing his raw ratings, dividing each rating by the total. and multiplying each quotient by 100.

An extremely versatile information retrieval program allows the computer to be instructed to retrieve and print out individual job description for members of any group designated. These incumbents may be selected by case control number, by tasks which they perform, or by any single variable or combination of variables from the identification and background information section of the inventory. The heading of the individual job description is flexible. Responses an incumbent has made to any of the background information items may appear. An example of a computer printout of an individual job description is presented in Appendix I. An individual job description may be presented at a more general level in terms of percentages of time devoted to the various duties. Relative time spent on a duty is determined by summing the percentages of time spent on tasks in that duty.

Group Job Descriptions

A complex program has been written which enables the computer to generate composite job descriptions, made up of tasks performed, for any group of individuals where the cases can be defined in terms of background variables. For example, a job description can be computed for the group of incumbents who have taken a special course, or for those who have been on the job for less than six months, or for men in a surveyed specialty who are assigned to a particular unit. Indeed, a group job description can be generated in terms of values or ranges of values on as many as nine variables. Thus, it is perfectly feasible to obtain a description for a group of weather officers, say, who are all majors with regular commissions, who hold a Bachelor's degree in engineering and have completed a course in high altitude forecasting, have a minimum of 24 months' experience as meteorologists, are assigned to an overseas command, are less than 35 years of age, and are married or divorced.

The first page of the composite job description of 394 Medical Laboratory Specialists appears in Appendix II. The four columns on the right present data derived from individual job descriptions. These columns show respectively, the percentage of group members performing each task, the average percentage of time spent by those members who perform it, the average percentage of time spent on each task by all members of the group, and the cumulative sum of the average percentage of time spent by all members. The third column of group description data, like the individual job descriptions, sums to 100 per cent thus showing the distribution of work time for the group. The tasks are arranged in descending order of values in this column, the task upon which the largest percentage of time is spent being listed first. The fourth column, in which values of the third column are cumulated, is useful for quickly indicating the major tasks of the group. Tasks upon which no time is spent by the group are omitted. The printout identifies the job description as that of a particular group by means of a six-character code number, e.g., SPC003. Other entries in the printout heading show the number of cases in the survey sample, the number of tasks and the number of duties in the inventory, the number of members in the group, and the group title.

The duty-level job description for a group is derived in the same way as the task-level description but is based on individual duty descriptions instead of task descriptions. Any incumbent who performs one or more tasks in a duty category is said to perform the duty. The computer printout of the duty-level job description appears in exactly the same format as the task-level description.

Job Type Descriptions

The computer program having the greatest potentiality for manpower organization and personnel management is that which identifies and describes the job types existing in an occupational survey sample. This automated job-clustering program begins with the task-level job descriptions of the N individual members in the sample. For convenience, each individual is considered as a group, and the program is said to begin with N groups. In the first stage of the program the computer locates the two most similar of the N job descriptions, i.e., the two with the greatest overlap, combines them into a single cluster, and computes the consolidated job description. The total number of groups is thus reduced to N-1. In the next stage the computer locates and combines the two most similar of the N-1 groups either by adding an individual to the pair already combined or by combining two individuals to form a new group. The total number of groups is then reduced to N-2. In successive stages the computer continues to combine individuals, to add individuals to groups, and to merge groups, according to the similarity of their job descriptions. This process is repeated until all individuals are combined into a single group. A record is generated during the grouping process which shows the number of members, and the homogeneity of each group formed. Task and duty descriptions are printed out upon request for groups formed at any stage of the grouping process. Job-type descriptions appear in the same format as other group descriptions previously described. A page from a typical job-type description is shown in Appendix III.

The overlap of two individuals on a task is defined as the smaller of the per cent time spent values on the task, and the total overlap between individuals is the sum of their task overlap values. The overlap between groups of two or more members is found by computing the average of the overlaps between each member of one group with each member of the second group. Thus when a group of three members merges with a group of two the overlap of these groups is the average of six overlap values. The overlap between groups is the critical value upon which the automated job-clustering program operates. The overlap

values are printed out to indicate the degree of similarity of the two groups merged at any given stage. These values become progressively smaller as the grouping continues from stage N-1 to stage 1.

In addition to the overlap between groups, the average overlap of members within a group is also computed. This value is the average of the overlaps among all members including the 100 per cent overlap of each member with himself. This measure is a descriptive index that indicates the homogeneity within each group after it has been formed.

Final selection of groups to be reported as significant job types is based on overlap between groups merged, overlap of members within the group, the size of the group, and the background data pertaining to group members. As a working rule, groups of five members or more having a between group overlap of 35 per cent and a within group overlap of 50 per cent, are selected as job types. However, much depends on the judgment of the job analyst in identifying job types which are significant in terms of their usefulness in guiding decisions with respect to personnel management and training.

Static and Dynamic Descriptions of Career Ladders

Job survey data ordinarily give a static picture of a career ladder, the ladder as it was at the date of the survey. However, a dynamic picture can be obtained if a second survey of the individuals working in the career ladder is conducted after a given interval. By observing the number of cases in each job type in the first as compared with the second survey, those jobs which are expanding and those which are dying out can be identified. The data can also be introduced into a flow model to determine how personnel move among job types within the ladder. Such information can have important implications for job classification and training. There is a tendency for supervisors to assign men according to their past experience when there is sufficient flexibility in work assignment to do so. Thus the Air Force may be operating several de facto, officially unrecognized, career ladders within a single ladder. This specialization tends to produce the perhaps undesirable result that an individual entering the ladder will receive training on many tasks he is unlikely to encounter. One solution is for the Air Force to recognize officially certain operating career ladders not now specified in the classification structure.

Quantitative Similarities of Jobs

The extent to which the work of an individual is similar to that of another individual or is typical of the work of a group can readily be determined. If, for example, the individual spends 5 per cent of his work time on a task but the average time spent by members of the group is 2 per cent, the degree of overlap of the individual and group job descriptions on the particular task is the smaller of the two percentage values, or 2 per cent. In the same way the amount of overlap of the individual with the group on every other task in the inventory may be computed. The sum of these values gives the total overlap or similarity between the individual job description and the group job description. The extent to which an individual job resembles the composite job description of a group, or the degree to which job descriptions are similar, is shown by means of a computer program which reports a matrix of job overlap values. The average overlap of group members with their composite job description, in terms of percentage of time spent on tasks, constitutes an index of group homogeneity. In addition to providing a condensed picture of interrelationships among individuals, job types, or other groups, the overlap matrix assists the investigator in identifying needs for new shredouts or for combining existing shredouts. A part of an overlap matrix is shown in Appendix IV.

Quantitative Differences of Jobs

It is often quite as important to show how jobs are different as to show their similarities. A computer program has been developed which reveals differences in work being performed by any two specified groups of workers – job types, or other groups identified in terms of background variables. For instance, one can obtain a description of the differences in tasks being performed by individuals overseas, and those in the ZI; those who took a technical training course, and those who received directed duty assignments; those who find their work interesting, and those who find it dull. A typical difference description shows the percentage of each group performing each task; the average percentage of time spent by all group members of each group; differences in the percentages of group members performing each task; and differences in average estimated percentages of time spent on each task by the two groups. The tasks are arranged in order of the greatest positive difference in percentages of members performing through zero to the greatest negative difference. In the printout, tasks showing

no difference in percentages of time spent by each group are omitted. An excerpt from a typical job difference description appears in Appendix V.

Consolidation of Group Information by Task

Group job description information, as we have seen, is arranged in descending order of average percentages of time spent on tasks by all members of the group. In order more readily to make comparisons across groups, a computer program has been designed which compiles and prints out information from several job descriptions simultaneously. Data from as many as 12 groups may be shown in the same table. Tasks, identified by code number, are listed in inventory order and table entries show the percentage of the members of each group who perform each task. Groups are designated by code numbers along the top of the table. Data may be displayed for the total survey sample, or for any job type or other group specified, the groups being arranged in any desired order. For example, several job types, or skill-level groups, or groups having varying amounts of experience may be shown together. An alternative program lists tasks in inventory order but shows the average percentage of time spent on each task by group members.

These group summary reports are especially useful in comparing groups at various skill or experience levels. Job descriptions can be computed for groups of individuals who have been in the career ladder less than 6 months; 6 months to 1 year; 1 to 2 years; 3 to 4 years; and so on. The consolidated group summary table shows the percentage of individuals at each experience level performing each task. Thus, it can be shown when tasks come into play and when training should be given to be timely. Analysis of such data also reveals those tasks which are performed by new airmen, and those which normally are assigned only to experienced personnel. In one ladder, for instance, it was found that individuals were being trained in an entry-level course to perform a number of tasks which normally did not appear in jobs assigned to airmen during their first enlistment. A page from a group summary report is shown in Appendix VI.

Multi-ladder Surveys

In applying the Air Force method of job analysis there is no way in which comparisons can be made of work performed across career ladders unless workers in the ladders of interest all respond to the same inventory. Sometimes problems are found, however, concerning the overlap of work occurring in several related career ladders. This state of affairs was found in the Data Systems Career Field which is presently comprised of five ladders. Some programmers, it appears, are part-time computer operators; some system analysts also do programming; and members of all three of these ladders work on electronic accounting machine equipment. Air Force management felt that these ladders should be restructured to minimize overlap of work but needed more precise information about the nature and degree of overlapping activities upon which to base a final determination. A single, multi-ladder inventory covering the five data systems career ladders was constructed and administered. The subsequent analysis identified the job types and pinpointed areas of uniqueness and overlap. Headquarters USAF will use the resulting information to determine whether changes should be made in the classification structure. Any changes may, in turn, lead to revisions in courses of instruction.

Task Rating Factors

When completing job inventories, incumbents are normally asked to rate each task on some factor in addition to the relative time spent rating. Relative 7-point scales are usually used for these secondary task ratings. A man may be directed to rate task difficulty or criticality, or the extent to which he needs more training on the tasks he performs. He may indicate the degree to which he learned the task in school or on the job, or the amount of supervision required, and so on. An incumbent is never asked to respond to more than one such secondary factor. However, several task rating factors may be included in a survey, each one directed to a randomly selected subsample of incumbents. Computer programs have been written for analyzing and reporting secondary factor information. The table for a given factor is published in standard format with tasks listed in rows and groups identified in columns. The body of the table displays the N responding, along with the mean and standard deviation of responses for each task-by-group category. A page of the report of an analysis of a task rating factor by groups appears in Appendix VII.

Analysis of Job-Related Variables

A program provides an analysis of background and job-related information collected during an occupational survey. The output reports means, standard deviations, and distributions of responses for the entire survey sample or selected subsample for any variables specified. Information may be obtained, for example, on the number of surveyed incumbents in each command, or the distribution of the sample according to time in grade, time in a particular assignment, time in the career ladder, or time in the Air Force. Data may include the number of incumbents working overseas as compared with those assigned in the continental United States, the extent to which certain tools are used, types of equipment worked on, or the number of graduates of a particular training course. The extent to which the job utilizes the individual's talent and training or provides job satisfaction may also be indicated. The investigator has complete flexibility in selecting variables from the background information section and in prescribing intervals to be used in the distributions. A page of a printout obtained from the analysis of background information variables is shown in Appendix VIII.

Another program is used to describe individual members in terms of history and background information. The computer tabulates the data available for each member of the survey sample under appropriate headings. The tabulation will include such data as command, grade, specialty, years of education, months of active federal military service, special courses attended, position title, and organization. The information is printed out in "KPATH sequence" during the automatic job-clustering routine. Each line of the printout shows data for one case which is identified with a sequence number. The KPATH sequence numbers are assigned by the computer in such a way that group members combined at any stage appear together. The members of any job type are thus always found within a given KPATH sequence range. These history and background summary reports are extremely useful. For instance, they serve to identify persons working above or below their skill level or to define jobs which can be performed by inexperienced personnel.

Occupational Analysis Survey Report

Finally, a program has been designed to select and arrange job descriptions and tables, produced by the programs previously discussed, in any desired order for publication. Verbal texts including tables of contents and descriptive or explanatory materials may be introduced in any part of the report. The computer is then used as a means for publication of the comprehensive "Occupational Analysis Report" which may run to 1,000 pages or more. The publication procedures will be greatly facilitated by the planned addition of an optical scanner for data conversion and a Magnetic Tape Selectric Typewriter converter. The optical scanner will eliminate almost all key punching of survey data while the converter will permit free text materials to be put on electronic tape for direct input into the computer.

IV. SOME APPLICATIONS

The applications of the results of occupational surveys conducted in the Air Force are many and diverse. The nature and variety of these uses can be inferred from the examples which follow.

Training

Job analysis has a number of important applications in the area of training. Thus, job analysis information can be used for developing and validating training curricula. It can reveal whether course graduates perform tasks without on-the-job training. It can be used to determine what training should be given and when it should be given to be timely. Information with respect to the number and grade of individuals performing tasks and the percentage of work time spent upon them will help to define training course subject matter. Readministration of job inventories to samples of incumbents at intervals of a year or two, makes possible a comparison of work activities across time. Tasks that are dying out and tasks appearing more often can be identified. The flow-rate of individuals from one job type to another, or from one grade level to another, or from one part of the country to another, can also be determined. Information derived from resurveys is invaluable in keeping training curricula current. By obtaining supervisors' task ratings indicating ability of their subordinates to perform, training can be increased for those tasks which cannot be performed adequately by a significant number of incumbents. Job analysis information can be used in determining the content of Career Development Courses and in establishing and monitoring on-the-job training programs. It can

lead to job simplification to minimize training time.

As early as 1964, the Air Training Command recognized the utility of the job analysis procedures that had been developed and requested Headquarters United States Air Force to establish an occupational survey capability. Failing to obtain the necessary manning, however, the Air Training Command in 1967 set up the Job Specialty Survey Division which has been conducting operational surveys since that time.

Individual Experience Records

Since all the jobs in an occupational area can be defined in terms of subsets of tasks in a job inventory, the inventory provides a means for maintaining detailed individual experience records. The Air Force does not currently obtain experience records at the task level, but such information would be extremely valuable in controlling the career progression of Air Force personnel. Upon a man's reassignment, his new supervisor would have available specific information with respect to the occupational experience of the new assignee. He could immediately relate such task experience information to his needs since his job openings would be definable in the same terms. Thus both the capabilities of the potential incumbent and the nature of the job to be filled could be precisely communicated. The beginning of the background and experience record for an individual might well include training he had received in a vocational school.

Personnel Evaluation

Survey data can be used to assure the content validity of the Specialty Knowledge Tests used in assessing airman capabilities. However, job analysis information has potential for more direct use in personnel evaluation. Supervisory ratings as manifest in Airmen Performance Reports are notoriously inflated but it is believed that such ratings made at the task level would reduce or eliminate inflation. The supervisor would estimate the worth of the individual to the Air Force in terms of his ability to perform or to learn to perform the tasks in jobs to which he might be assigned. Exaggeration of a subordinate's ability to perform tasks would not be easy since ratings would be subject to verification. It is anticipated also that the supervisor's knowledge that his ratings will be used for reassignment of his subordinates will encourage him to be objective and accurate. The final evaluation scores based on supervisors' task ratings will be derived by the computer by comparing the individual with his contemporaries.

Personnel Planning

Job analysis data have broad implications in developing controlled career progression programs and in assuring optimum utilization of talent and training. Job information can be used to pinpoint the need for job enlargement to increase the flexibility, productivity, morale, and satisfaction of workers. On the other hand, job data can be utilized to show the need for job specificity and purification to conserve skills of high-level personnel by assignment of routine, repetitive, clerical, non-technical tasks to low-skill levels

When coupled with information concerning task difficulty and criticality, job incumbent characteristics, and job location, the job inventory provides basic data for reengineering jobs and for generating assignment and reassignment systems. The tasks listed in a career ladder inventory provide an ideal framework for maintaining records on individuals concerning their work experience, work performance, and predicted work potential. By including individual experience records as part of the information available, requirements of jobs can be associated with abilities of men elibible for reassignment. Computer programs are then used to allocate men to jobs so as best to utilize available talent, minimize retraining costs, give weight to travel expense, individual preferences, and other factors. Thus the job survey method is used to identify the tasks in each job, and supervisory ratings are used to evaluate the ability of individuals to perform those tasks. Both kinds of information are needed for reassignment actions.

Objective Job Evaluation

Based in large part on the information and results of earlier research, the Officer Grade Requirements (OGR) project was accomplished to determine the proper distribution of officer grades. A special Headquarters USAF Policy Board was convened to judge the appropriate grade for each of 3,575 selected officer positions. Analyses of the judgments revealed that board members were confident in their grade ratings: were not

biased toward jobs in their particular commands or specialties; agreed with each other concerning appropriate grades for jobs; and did not give inflated ratings or simply confirm UMD statements. Comprehensive research was conducted to determine how grade requirement factors should be weighted by a mathematical equation to reproduce board actions. This "policy" equation was applied to evaluate grade requirements of an additional 10,600 jobs, and the results were projected to determine the appropriate distribution of grades for each utilization field. Later studies, using boards of NCOs and officer raters, resulted in identification of factors appropriate for determining airman grade requirements. In a follow-up of the OGR project, a set of "benchmark" scales was developed for evaluating officer jobs. These scales are less subject to inflation than the original OGR factor scales, and are equally effective in simulating ratings of the OGR policy board.

In order further to improve grade determination, research is presently under way in which objective questions are asked about a job in order to get the appropriate level on each factor. Answers to such questions as the following are solicited from supervisors task by task for every task in a job inventory:

1. What level of supervision does this task require?

2. What level of decision-making is involved in this task?

3. What level of communication is implied by this task?

Computer programs have been designed to determine the average unit of supervision, decision making, communication, and so on, per unit of time. From these values a scale level is obtained for every factor and for every task in every job. This information is then put into the equation to duplicate the estimates made by the rating board.

Occupational Classification

Data derived from job surveys are analyzed to identify job types and supervisory task rating information can be used to determine which job types should be shredded out and which should be combined into new specialties. A job type normally would be shredded out when there are few individuals at the appropriate skill level in a career ladder who can learn to perform the tasks it includes without substantial training. Similarly, a shredout would be eliminated when it is discovered that many individuals who are in the ladder, but not in the shredout, can easily learn the tasks it includes. In this way job analysis information can be used in establishing specialties, career ladders, or other management categories, and in maintaining classification structures. Job data can be utilized in setting aptitude minimums and other job requirements. Such data will also serve to identify jobs which should be civilianized, or jobs which can be performed by low ability airmen.

Occupational Data Bank

The potential advantages of maintaining a current occupational data bank comprised of job information derived from all Air Force specialties have long been recognized. Since 1950 several attempts have been made to develop procedures by which a body of job data could be established. Until the development of improved job analysis methods and the advent of the computer, however, such efforts were largely unrewarding. They were impractical and prohibitively expensive in terms of projected results. Using adaptations of the Air Force method of job analysis, both the U.S. Army and the Canadian Defense Forces are developing occupational data banks. As yet the establishment of an Air Force occupational data bank has not been implemented. The day may be imminent, however, when all vacancies in the Air Force are fed into a central location. Individuals being transferred would then have access to detailed information concerning jobs wherever they exist. An information retrieval system hooked into such a data bank would have tremendous potential for matching jobs with the skills, experiences, and interests of workers.

Manpower Management

Job analysis data have many applications in areas of manpower management. Both organizational analysis and manpower analysis are dependent upon accurate job information. Such data have utility for validating qualitative and quantitative personnel requirements information. Job analysis information is needed for weapon systems designers; for controlling overseas – ZI imbalance; and for work simplification to exploit more effectively the skills available. In a more general context, job information is required for mobilization planning and for determining and controlling force capabilities.

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APPENDIX I. COMPUTER PRINTOUT OF AN INDIVIDUAL JOB DESCRIPTION

CASE CTRL NUMBER =0462
NAME =
GRADE =E-4 (SGT)
DUTY AFSC =67153
TOT MOS PRES ASNMT =010
TOT MOS AFMS =040
NO. SUBORDINATES =NONE
I FIND MY JOB =FAIRLY INTERESTING
UTIL OF TAL/TRNG =FAIRLY WELL
PLAN TO RE-ENLIST =DEFINITELY NOT
ORGANIZATION/BASE =HQ 636 CSGP CLARK AB PI
MAJOR COMMAND =PACAF

D-TSK	TASK TITLE	PER CENT TIME SPENT	CUMULATIVE PER CENT
H 21	MAINTAIN CUSTODY OF CURRENCIES, CHECKS, OR OTHER NEGOTIABLE INSTRUMENTS	7.37	7.37
H 39	PREPARE SUPPORTING SCHEDULES TO THE STATEMENT OF ACCOUNTABILITY	7.37	14.74
H 7	COUNT OUT CASH FOR PAYMENTS	7.37	22.10
H 13	IDENTIFY PAYEES	7.37	29.47
H 38	PREPARE STATEMENT OF AGENT OFFICERS ACCOUNT (DD FORM 1081)	7.37	36.84
H 33	PREPARE MONEY LIST FOR CASH PAYMENTS	7.37	44.21
H 40	PREPARE SUMMARIES SUCH AS THE DAILY SUMMARY OF CASH COLLECTIONS OR CASHIER'S DAILY SUMMARY	7.37	51.58
H 29	PERFORM CASH AND CHECK ACCOUNTABILITY FUNCTIONS	7.37	58.94
H 14	INFORM OWNERS OF LOST BONDS OR CHECKS AS TO REPLACEMENT PROCEDURES	5.26	64.21
H 15	INITIATE SUBSTITUTE OR STOP PAYMENT REQUESTS	5.26	69.47
H 32	PREPARE MILITARY OR CIVILIAN PAY CHECKS FOR ISSUE OR MAIL	5.26	74.73
H 42	PREPARE TREASURY LIST AND MONTHLY REPORT ON TREASURY CHECKS	5.26	80.00
H 43	PREPARE U. S. TREASURY CHECKS	5.26	85.26
H 23	MAINTAIN FILE OR LOG OF RETURNED AND UNDELIVERED TREASURY CHECKS	4.21	89.47
H 27	MAINTAIN RETURNED AND UNDELIVERED TREASURY CHECK RECORD (AF FORM 1395)	4.21	93.68
H 4	BALANCE MILITARY PAYROLLS WITH CHECK LISTINGS AND COMPUTER OUTPUT	3.16	96.84
H 3	AUDIT U. S. TREASURY CHECKS AGAINST VOUCHERS	3.16	99.99

APPENDIX II. GROUP JOB DESCRIPTION BY TASKS – MEDICAL LABORATORY SPECIALIST DAFSC 90450B

JOB DESCRIPTION FOR AIRMEN IN MEDICAL LABORATORY CAREER LADDER 1FSC 904X0

TASK JOB DESCRIPTION,CASES= 619,TASKS= 301,DUTIES= 17,MBRS= 394
AIRMEN WITH 90450W DAFSC
TIME PERFECTLY DESCRIBED ON DUTIES= 71.70,TASKS= 55.44

D-TSK		DUTY/TASK TITLE	CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	AVERAGE PERCENT TIME SPENT BY MEMBERS PERFORMING	PERCENT OF MEMBERS PERFORMING
F	18	COLLECT BLOOD SPECIMENS DIRECTLY FROM PATIENTS	93.40	1.70	1.58	1.58
J	3	PERFORM BLOOD COUNT	89.09	1.56	1.39	2.98
J	17	PERFORM HEMATOLOGY PROCEDURES FOR DIFFERENTIAL CELL COUNTS	88.83	1.49	1.33	4.30
J	24	PERFORM HEMATOLOGY PROCEDURES FOR HEMATOCRIT TESTS	89.09	1.45	1.30	5.60
N	2	EXAMINE URINE SPECIMENS MICROSCOPICALLY	88.07	1.43	1.26	6.85
J	5	PREPARE BLOOD SMEARS	89.85	1.39	1.25	8.10
F	10	PREPARE AND PROCESS SPECIMENS	87.56	1.39	1.22	9.32
N	9	PERFORM URINALYSES FOR GLUCOSE TESTS	87.32	1.38	1.21	10.53
N	15	PERFORM URINALYSES FOR SPECIFIC GRAVITY TESTS	87.06	1.38	1.20	11.73
N	6	PERFORM URINALYSES FOR ALBUMIN TESTS	87.06	1.36	1.19	12.92
F	3	CLEAN AREA AND EQUIPMENT ASEPTICALLY	80.96	1.46	1.18	14.10
M	1	EXAMINE URINE SPECIMENS MACROSCOPICALLY	87.82	1.32	1.16	15.26
J	6	SEPARATE SERUM FROM BLOOD	87.31	1.30	1.14	16.40
F	11	PREPARE REAGENTS	93.40	1.19	1.11	17.51
J	2	IDENTIFY MORPHOLOGICAL VARIATIONS OF BLOOD CELLS	88.57	1.21	1.06	18.57
M	4	OPERATE SPECTRO-PHOTOMETER	77.66	1.34	1.04	19.62
J	21	PERFORM HEMATOLOGY PROCEDURES FOR ERYTHROCYTE SEDIMENTATION RATE	87.56	1.19	1.04	20.65
K	7	PERFORM SEROLOGICAL PROCEDURES FOR CARDIOLIPIN MICROFLOCCULATION	78.93	1.30	1.03	21.68
G	1	EXAMINE SPECIMENS MICROSCOPICALLY	86.04	1.18	1.01	22.69
G	2	IDENTIFY AND CLASSIFY PATHOGENIC BACTERIA	78.68	1.27	1.00	23.69
G	10	PREPARE CULTURE MEDIA	78.68	1.26	0.99	24.68
F	12	PREPARE SOLUTIONS AND STANDARDS	86.55	1.09	0.94	25.62
M	25	PERFORM BIOCHEMICAL PROCEDURES FOR LIVER FUNCTION TESTS	78.93	1.18	0.93	26.55
M	27	PERFORM BIOCHEMICAL PROCEDURES FOR NPN AND BUN TESTS	79.95	1.16	0.93	27.48
G	11	STAIN BACTERIOLOGICAL SMEARS	85.28	1.08	0.92	28.41
L	3	CROSSMATCH BLOOD	72.59	1.24	0.90	29.30
L	16	TEST BLOOD FOR ABO GROUPING AND ABO SUBGROUPING	80.20	1.12	0.90	30.20
J	1	IDENTIFY IMMATURE BLOOD CELLS	86.29	1.04	0.89	31.09
I	2	EXAMINE SPECIMENS MICROSCOPICALLY	81.47	1.08	0.88	31.97
G	6	PERFORM ANTIBIOTIC SENSITIVITY TEST	75.38	1.17	0.88	32.85
F	14	PREPARE SPECIMENS FOR SHIPMENT	84.26	1.03	0.87	33.72
E	3	LOG INCOMING OR OUTGOING SPECIMENS	71.83	1.16	0.83	34.55
L	18	TYPE BLOOD OF DONORS AND RECIPIENTS	74.87	1.10	0.83	35.38
L	2	CENTRIFUGE AND SEPARATE SERUM FROM CLOT	73.10	1.11	0.81	36.19
M	33	PERFORM BIOCHEMICAL PROCEDURES FOR TOTAL PROTEIN AND A/G RATIO	75.13	1.06	0.79	36.99
L	17	TEST BLOOD FOR RHO OR DU FACTORS	76.14	1.04	0.79	37.78
L	8	PERFORM DIRECT AND INDIRECT COOMBS TESTS	75.38	1.04	0.78	38.56
M	5	PREPARE REAGENTS AND STANDARDS	75.38	1.01	0.76	39.37

APPENDIX III. JOB TYPE DESCRIPTION BY TASKS – FOOD AND SANITATION INSPECTOR

TASK JOB DESCRIPTION,CASES= 327,TASKS= 256,DUTIES= 11,MOBS= 20
KPATH ORDER FROM 213 TO 23. GROUP STAGE= 3C
TIME PERFECTLY DESCRIBED ON DUTIES= 77.85,TASKS= 56.78

D-TSK		DUTY, TASK TITLE	CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS.....	AVERAGE PERCENT TIME SPENT BY ALL MEMBERS.....	AVERAGE PERCENT TIME SPENT BY MEMBERS PERFORMING....	PERCENT OF MEMBERS PERFORMING.....
C	21	INSPECT PERISHABLE FOODS FOR CONTRACT COMPLIANCE	90.00	4.10	3.69	3.69
E	22	INSPECT PREPACKAGED FROZEN FOODS	100.00	3.32	3.32	7.02
G	3	INSPECT ARRANGEMENTS OF DUNNAGE AND FOOD ITEMS	100.00	3.31	3.31	10.33
E	14	INSPECT EGGS AND EGG PRODUCTS	100.00	3.02	3.02	13.35
G	5	INSPECT STOCK ROTATION CONTROL METHODS	100.00	2.93	2.93	16.27
G	2	INSPECT AND RECOMMEND PROPER HANDLING OF STORAGE ITEMS	95.00	3.08	2.92	19.19
E	24	INSPECT SANITARY CONDITIONS OF CONTAINERS AND VEHICLES USED FOR SHIPMENT	90.00	3.16	2.84	22.04
B	3	COMPILE STATISTICAL DATA FOR RECORDS AND REPORTS	65.00	4.32	2.81	24.84
G	8	PERFORM ORGANOLEPTIC EXAMINATIONS	100.00	2.68	2.68	27.52
E	33	REPORT RECOMMENDED REJECTIONS OF SUBSISTENCE ITEMS TO CONTRACTING OFFICER AND TO COMMISSARY OFFICER	95.00	2.80	2.66	30.18
E	13	INSPECT DAIRY PRODUCTS FOR QUALITY AND CONTRACT COMPLIANCE	75.00	3.45	2.59	32.77
C	4	INSPECT MAINTENANCE OF TEMPERATURE AND HUMIDITY LEVELS IN STORAGE AREAS	95.00	2.72	2.59	35.36
E	18	INSPECT MISCELLANEOUS PRODUCTS SUCH AS FATS, OILS, MARGARINE, AND CEREAL	85.00	2.91	2.47	37.83
E	9	GRADE EGGS TO DETERMINE CONTRACT COMPLIANCE OF EGGS AND EGG PRODUCTS	80.00	3.07	2.46	40.29
G	6	INSPECT STORAGE AREAS FOR INSECT AND RODENT CONTROL	95.00	2.58	2.45	42.74
G	9	RECOMMEND IMMEDIATE USE OR OTHER DISPOSITION OF DETERIORATED ITEMS	90.00	2.63	2.37	45.11
E	19	INSPECT NONPERISHABLE SUBSISTENCE ITEMS FOR CONTRACT REQUIREMENTS	70.00	3.10	2.17	47.28
G	1	DETERMINE EXPECTED SHELFLIFE, CONDITION OF GOODS, AND ADEQUACY OF SUPPLY FOR EMERGENCIES	65.00	2.93	1.91	49.18
B	24	MAINTAIN FILES OF RECORDS, FORMS, CORRESPONDENCE, AND REPORTS	50.00	3.61	1.80	50.99
E	11	GRADE PERISHABLE FOODS FOR CONTRACT COMPLIANCE	50.00	3.56	1.78	52.77
E	6	COLLECT LABORATORY SAMPLES OF SUBSISTENCE ITEMS	80.00	2.20	1.76	54.53
F	5	CONDUCT SANITARY INSPECTIONS OF BASE FACILITIES	65.00	2.53	1.64	56.17
G	7	INSPECT STORAGE OF EMERGENCY, SURVIVAL, AND IN-FLIGHT RATIONS	70.00	2.26	1.58	57.75
E	31	PREPARE LABORATORY SAMPLES FOR SHIPMENT	70.00	2.10	1.47	59.22
E	15	INSPECT EMERGENCY AND SURVIVAL RATIONS	65.00	2.16	1.41	60.63
E	20	INSPECT PACKING METHODS AND PACKAGING	60.00	2.32	1.39	62.02
E	29	MAINTAIN LIST OF FEDERAL AND MILITARY SPECIFICATIONS	60.00	2.32	1.39	63.42
E	16	INSPECT INFLIGHT MEALS	65.00	2.11	1.37	64.79
E	23	INSPECT PROCEDURES FOR LOADING AND TRANSPORTING SUBSISTENCE ITEMS	40.00	3.20	1.28	66.07
E	28	MAINTAIN LISTS OF APPROVED SOURCES FROM OTHER GOVERNMENTAL AGENCIES	65.00	1.91	1.24	67.31

APPENDIX IV. GROUP SIMILARITIES IN TERMS OF OVERLAP OF AVERAGE PERCENTAGE OF TIME SPENT ON TASKS

	SPC001	SPC002	SPC003	SPC004	SPC005	SPC006	SPC007	SPC008	SPC009	SPC010	SPC011	SPC012
SPC001	100.000	32.917	72.644	47.476	24.682	36.693	77.612	83.049	75.186	68.847	58.694	49.134
SPC002	32.917	100.000	18.862	9.832	26.576	12.956	36.096	34.164	27.572	23.465	16.066	9.857
SPC003	72.644	18.862	100.000	63.489	29.802	48.393	59.290	77.069	86.951	85.110	76.767	66.685
SPC004	47.476	9.832	63.489	100.000	47.825	77.734	34.397	49.676	56.530	70.147	82.368	86.747
SPC005	24.682	26.576	29.802	47.825	100.000	60.333	20.873	31.368	32.456	38.524	44.746	44.665
SPC006	36.693	12.956	48.393	77.734	60.333	100.000	28.004	40.962	43.820	55.850	67.263	70.370
SPC007	77.612	36.096	59.290	34.397	20.873	28.004	100.000	69.678	63.168	54.949	45.200	36.786
SPC008	83.049	34.164	77.069	49.676	31.368	40.962	69.678	100.000	80.538	72.017	61.808	51.005
SPC009	75.186	27.572	86.951	56.530	32.456	43.820	63.168	80.538	100.000	79.769	69.489	59.207
SPC010	68.847	23.465	85.110	70.147	38.524	55.850	54.949	72.017	79.769	100.000	82.421	71.115
SPC011	58.694	16.066	76.767	82.368	44.746	67.263	45.200	61.808	69.489	82.421	100.000	82.354
SPC012	49.134	9.857	66.685	86.747	44.665	70.370	36.786	51.005	59.207	71.115	82.354	100.000
SPC013	47.521	10.643	61.452	91.647	50.359	80.581	33.970	49.165	54.429	67.801	78.742	82.467
SPC014	41.941	8.999	56.970	86.640	48.541	79.155	31.445	44.283	50.117	62.334	73.963	79.434
SPC015	82.001	31.262	83.955	53.859	31.662	42.937	69.737	88.920	90.809	77.485	66.826	55.914
SPC016	52.900	12.772	69.821	91.670	47.595	74.518	39.452	55.685	62.605	75.404	88.958	89.166
SPC017	79.708	28.337	89.927	59.465	33.284	47.005	65.067	84.656	90.683	83.816	73.086	61.743
SPC018	71.300	19.463	87.482	63.811	31.017	49.106	58.122	74.024	79.407	82.772	75.873	69.548
SPC019	45.450	10.659	60.280	94.191	52.923	81.166	32.910	48.042	54.144	67.341	80.305	85.133
SPC020	54.384	17.906	68.609	81.569	48.542	70.470	43.423	57.380	64.390	76.322	81.955	76.850
SPC021	71.027	18.230	90.357	63.075	28.703	47.293	57.970	74.201	83.582	81.598	75.349	64.808
SPC022	71.027	18.230	90.357	63.075	28.703	47.293	57.970	74.201	83.582	81.598	75.349	64.808
GRP054	49.777	9.856	65.641	93.500	45.430	75.264	35.720	51.031	58.147	71.964	82.257	86.640
GRP023	12.134	5.823	23.705	51.373	68.460	63.151	7.727	17.748	19.547	29.680	41.014	47.334
GRP036	32.612	1.783	45.921	38.574	18.386	28.833	29.272	37.112	41.042	41.806	41.769	43.597
GRP042	76.978	20.006	89.622	60.494	27.795	45.681	62.202	78.657	83.896	81.594	73.056	62.846
GRP027	45.399	18.234	49.413	26.732	16.939	20.252	54.264	49.677	49.032	40.976	34.994	31.931
GRP029	35.732	1.072	42.817	26.296	5.110	15.322	32.389	36.991	41.509	34.516	31.915	30.174
GRP050	52.181	5.437	64.886	45.785	13.522	30.998	45.278	51.955	63.354	57.718	52.809	48.256
GRP072	29.266	1.742	45.491	39.337	18.765	28.792	26.120	33.370	42.663	42.414	42.281	41.098
GRP030	52.160	16.839	59.927	44.581	20.409	32.880	45.662	52.621	58.270	59.161	53.023	46.597
GRP053	40.713	45.376	27.986	16.057	19.685	16.990	45.524	40.568	28.903	29.319	22.869	15.215
GRP046	32.509	42.333	30.616	42.445	74.344	51.233	29.151	38.731	35.333	40.804	41.867	39.737
GRP111	36.103	78.774	17.741	7.241	23.436	10.554	41.422	35.132	26.833	21.797	14.041	7.254
GRP087	22.948	69.712	13.012	7.509	21.104	9.817	25.259	24.944	21.005	16.201	11.511	7.697
GRP001	69.744	22.453	85.076	74.076	41.979	60.453	55.569	73.613	80.838	89.192	86.287	75.402

APPENDIX V. GROUP DIFFERENCES IN TERMS OF PERCENTAGE OF MEMBERS PERFORMING EACH TASK

GROUP DIFFERENCES FOR HELICOPTER MECH CAR LADDER-431X0 AFHRL,PERS RSCH DIV-AFSC
LACKLAND AFB, TEX 78236
SPC003 MEMBERS = 165 AIRMEN WITH DAFSC 43170-HELICOPTER TECHNICIAN
SPC002 MEMBERS = 521 AIRMEN WITH DAFSC 43150-HELICOPTER MECHANIC

AVERAGE PERCENT TIME BY ALL GROUP MEMBERS---DIFFERENCE, SPC003 MINUS SPC002
PERCENT MEMBERS PERFORMING---DIFFERENCE, SPC003 MINUS SPC002
SPC003 AVERAGE PERCENT TIME BY ALL GROUP MEMBERS
SPC003 PERCENT MEMBERS PERFORMING
SPC002 AVERAGE PERCENT TIME BY ALL GROUP MEMBERS
SPC002 PERCENT MEMBERS PERFORMING

D-TSK		TASK TITLE						
C	14	PREPARE AIRMEN PERFORMANCE REPORTS (AF FORM 911, 910, 909, OR 77A)	7.49	0.04	69.70	0.58	62.21	0.54
B	4	COUNSEL SUBORDINATES ON JOB PROGRESSION	13.63	0.09	70.91	0.62	57.28	0.54
B	19	SUPERVISE HELICOPTER MECHANICS (43150)	19.58	0.15	75.76	0.73	56.18	0.58
A	6	COORDINATE WORK REQUIREMENTS WITHIN THE SECTIONS OR WITH OTHER BASE ACTIVITIES	10.94	0.07	65.45	0.64	54.51	0.57
B	23	SUPERVISE MAINTENANCE OR REPAIR OF HELICOPTERS	28.02	0.21	81.82	0.82	53.80	0.61
B	21	SUPERVISE INSPECTION OF HELICOPTERS	22.07	0.16	75.76	0.75	53.68	0.59
D	1	ADMINISTER WRITTEN, ORAL, OR PERFORMANCE TESTS	11.90	0.18	61.21	0.65	49.31	0.47
A	3	COORDINATE MATERIAL AND PERSONNEL WITH WORK REQUIREMENTS AND PRODUCTION SCHEDULES	13.24	0.08	61.21	0.57	47.97	0.49
D	7	INDOCTRINATE NEWLY ASSIGNED PERSONNEL	12.86	0.06	60.00	0.54	47.14	0.47
A	7	DEVELOP AND IMPROVE WORK METHODS AND PROCEDURES	16.12	0.09	63.03	0.57	46.91	0.48
D	9	MAINTAIN AND REVIEW OJT RECORDS (AF FORM 623)	16.70	0.11	63.03	0.71	46.33	0.60
A	18	SCHEDULE MAINTENANCE WORKLOAD AND DUTY ASSIGNMENTS	7.68	0.04	53.33	0.54	45.66	0.49
B	10	PREPARE OR EDIT CORRESPONDENCE OR REPORTS	5.18	0.10	49.09	0.64	43.91	0.54
D	10	PLAN AND SCHEDULE ON-THE-JOB PROGRAM	3.26	0.01	45.45	0.39	42.19	0.38
. . . . .								
G	7	PARK AIRCRAFT	88.48	0.93	66.06	0.40	-22.42	-0.53
G	3	DRAIN AND FLUSH TRANSMISSION OIL SYSTEMS	76.58	0.57	53.94	0.24	-22.64	-0.33
G	14	REFUEL OR DEFUEL AIRCRAFT	88.87	0.89	66.06	0.41	-22.81	-0.49
F	11	COAT OR PAINT AIRCRAFT EQUIPMENT	73.13	0.60	47.88	0.22	-25.25	-0.38
G	18	SERVICE AND LUBRICATE FLIGHT CONTROL SYSTEMS OR COMPONENTS	87.14	0.78	61.21	0.37	-25.93	-0.41
F	10	CLEAN MAINTENANCE AREAS TO PREVENT FOD	93.47	1.07	67.27	0.50	-26.20	-0.57
G	11	PREPARE AIRCRAFT FOR TOWING	94.24	1.00	66.06	0.43	-28.18	-0.57
G	26	SERVICE TRANSMISSION OIL SYSTEMS AND COMPONENTS	91.55	0.83	63.03	0.35	-28.52	-0.48
G	19	SERVICE ENGINE OIL SYSTEMS	89.44	0.84	60.61	0.35	-28.84	-0.49
F	9	CLEAN LANDING GEAR	85.22	0.76	55.76	0.31	-29.46	-0.45
F	3	CLEAN AND WAX ROTOR BLADES	79.27	0.76	49.09	0.30	-30.18	-0.46
F	4	CLEAN COMPONENTS OF EQUIPMENT REMOVED FROM HELICOPTER	91.56	0.84	56.97	0.33	-34.39	-0.51
F	13	LUBRICATE AIRCRAFT COMPONENTS SUCH AS BEARINGS OR FITTINGS	92.51	0.92	57.58	0.35	-34.94	-0.57
F	6	CLEAN EXTERIOR PLASTIC SURFACES	90.98	0.94	55.15	0.32	-35.83	-0.62
F	2	CLEAN METAL AIRCRAFT SURFACES	90.02	0.94	53.33	0.33	-36.69	-0.60
F	1	CLEAN AIRCRAFT INTERIOR	94.05	1.02	56.36	0.36	-37.69	-0.66

APPENDIX VI. PERCENTAGE OF MEMBERS PERFORMING EACH TASK – HELICOPTER MECHANIC GROUPS WITH INCREASING AMOUNTS OF ACTIVE FEDERAL MILITARY SERVICE

PERCENT MEMBERS PERFORMING

GROUP SUMMARY FOR HELICOPTER MECHANIC (431XX)

AFHRL,PERS RSCH DIV-AFSC
LACKLAND AFB, TEX 78236

DY-TSK	SPC015	SPC016	SPC017	SPC018	SPC019	SPC020	SPC021	SPC022	SPC023	SPC024
A 1	4.082	3.352	4.592	4.009	10.588	18.644	35.878	43.478	72.000	40.129
A 2	0.000	2.793	5.102	3.538	11.765	15.254	39.695	39.130	60.000	38.188
A 3	4.082	1.676	12.755	7.075	25.882	32.203	50.382	53.623	84.000	53.074
A 4	4.082	6.145	9.184	7.311	16.471	23.729	48.092	52.174	74.000	48.544
A 5	2.041	2.793	7.653	4.953	12.941	15.254	28.244	28.986	56.000	30.421
A 6	4.082	4.469	4.592	4.481	21.176	30.508	56.489	60.870	88.000	57.605
A 7	6.122	8.939	14.286	11.085	21.176	28.814	59.542	60.870	86.000	58.252
A 8	2.041	3.911	3.571	3.538	10.588	11.864	24.427	37.681	60.000	30.744
C 4	0.000	1.117	0.000	0.472	4.706	3.390	16.794	15.942	50.000	19.417
C 5	2.041	3.911	3.571	3.538	[illegible]	15.254	34.351	47.826	68.000	39.159
C 6	0.000	1.676	0.510	0.943	[illegible]	5.085	26.718	33.333	60.000	29.450
C 7	0.000	5.028	11.735	7.547	[illegible]	18.644	35.878	53.623	76.000	43.042
C 8	0.000	2.235	2.041	1.887	[illegible]	15.254	26.718	28.986	52.000	29.126
C 9	2.041	3.352	6.122	4.481	[illegible]	15.254	42.748	50.725	68.000	43.366
C 10	0.000	3.911	5.612	4.245	9.412	10.169	28.244	33.333	42.000	28.155
C 11	2.041	2.793	2.551	2.544	12.941	18.644	34.351	49.275	70.000	40.453
F 1	83.673	97.207	96.939	95.519	90.588	88.136	62.595	49.275	24.000	58.252
F 2	75.510	92.179	91.837	90.094	87.059	84.746	63.359	44.928	20.000	56.511
F 3	55.102	86.592	76.020	78.066	72.941	76.271	57.252	40.580	14.000	50.162
F 4	67.347	91.620	94.898	90.330	87.059	88.136	62.595	50.725	18.000	57.605
F 5	16.327	24.022	15 816	19.340	21.176	16.949	18.321	11.594	4.000	14.239
F 6	75.510	93.855	93.878	91.745	85.882	88.136	63.359	47.826	18.000	57.282
F 7	24.490	46.927	54.082	47.642	51.765	61.017	55.725	37.681	14.000	45.955
F 8	10.204	12.291	22.959	16.981	21.176	28.814	19.084	14.493	2.000	17.152
H 8	2.041	2.235	4.592	3.302	4.706	5.085	6.107	1.449	4.000	4.531
H 9	0.000	0.559	2.551	1.415	2.353	3.390	3.290	1.449	2.000	2.265
H 10	2.041	1.676	2.041	1.887	4.706	3.390	5.344	1.449	4.000	3.883
H 11	4.082	2.793	4.592	3.774	9.412	10.169	17.450	5.797	6.000	9.061
H 12	2.041	1.117	4.592	2.830	4.706	6.780	10.687	10.145	2.000	8.414
H 13	0.000	3.352	7.653	4.953	3.529	5.085	6.107	2.899	2.000	4.531
H 14	0.000	2.793	7.143	4.481	20.000	13.559	17.557	13.043	6.000	13.916
H 15	8.163	20.112	27.551	22.170	43.529	27.119	27.481	15.942	12.000	22.330
J 1	44.898	69.274	77.551	70.283	80.000	79.661	67.939	47.826	24.000	58.576
J 2	24.490	16.436	22.959	21.226	32.941	23.729	15.267	13.043	6.000	14.887
J 3	26.531	40.223	47.449	41.981	65.882	61.017	49.618	33.333	12.000	42.071
J 4	10.204	20.112	29.082	23.113	35.294	33.898	22.901	18.841	10.000	22.006
J 5	16.327	37.430	52.041	41.745	52.941	49.153	43.511	30.435	16.000	37.217
J 6	44.898	72.626	82.143	73.821	78.824	74.576	68.702	49.275	26.000	58.576
J 7	46.939	73.184	81.122	73.821	78.824	74.576	68.702	49.275	24.000	58.252
J 8	22.449	35.196	50.510	40.802	44.706	45.763	38.168	30.435	12.000	33.657

APPENDIX VII. ANALYSIS OF TASK RATING FACTOR BY GROUPS – TRAINING (HOW LEARNED)

ANALYSIS OF SECONDARY FAC 2 TRAINING(HOW LEARNED)BY DAFSC GROUPS/TOT SAMP

NUMBER OF GROUP MEMBERS WHO RATED EACH TASK, AND MEAN AND STANDARD DEVIATION OF TASK RATINGS. A RATING OF 1 INDICATES TASK WAS LEARNED ALL FROM SCHOOL TRAINING. RATING 2 INDICATES TASK WAS LEARNED ALMOST ALL FROM SCHOOL TRAINING. RATING 3 = MOSTLY FROM SCHOOL TRAINING, 4 = ABOUT FIFTY-FIFTY, SCHOOL TRAINING AND WORK EXPERIENCE, 5 = MOSTLY FROM WORK EXPERIENCE, 6 = ALMOST ALL FROM WORK EXPERIENCE, AND 7 = TASK WAS LEARNED ALL FROM WORK EXPERIENCE.

GROUP IDENT.		SPC001	SPC002	SPC003	SPC004	SPC043
GROUP MEMBERS		32	359	155	12	558
FACTOR SUBGROUP		32	359	155	12	558
DY-TK	VALUE					
A 1	N	3	70	72	9	154
	MEAN	5.000	6.057	6.069	5.889	6.032
	SD	1.414	1.739	1.347	1.197	1.539
A 2	N	2	63	104	11	200
	MEAN	6.500	5.723	6.058	6.273	5.935
	SD	0.500	1.467	1.223	1.135	1.334
A 3	N	2	5	13	3	23
	MEAN	4.500	6.200	6.231	5.667	6.000
	SD	0.500	0.400	1.042	1.247	1.063
A 4	N	0	12	41	5	58
	MEAN	0.000	5.500	6.024	6.000	5.914
	SD	0.000	1.607	1.239	1.095	1.330
A 5	N	0	2	7	4	13
	MEAN	0.000	7.000	5.857	6.250	6.154
	SD	0.000	0.000	0.990	0.829	0.948
A 6	N	0	6	8	5	19
	MEAN	0.000	6.167	6.625	6.600	6.474
	SD	0.000	0.898	0.992	0.490	0.881
A 7	N	1	5	14	3	23
	MEAN	5.000	7.000	5.286	6.333	5.783
	SD	0.000	0.000	1.532	0.471	1.413
A 8	N	3	74	105	11	193
	MEAN	6.000	5.311	5.895	6.091	5.684
	SD	1.414	1.559	1.218	0.996	1.384
A 9	N	0	8	16	5	29
	MEAN	0.000	5.750	6.375	6.800	6.276
	SD	0.000	1.090	1.111	0.400	1.079
A 10	N	0	3	6	3	12
	MEAN	0.000	5.667	6.167	6.667	6.167
	SD	0.000	0.943	1.213	0.471	1.067

APPENDIX VIII. ANALYSIS OF BACKGROUND INFORMATION VARIABLES – INTELLIGENCE OPERATIONS/PHOTO INTERPRETATION CAREER FIELD

VARSUM VARIABLES FOR DAFSC GROUPS

BACKGROUND VARIABLE DISTRIBUTIONS FOR INTEL OPNS/PHOTO INTERP INV - 204X0/206X0

REPORTS ON THE FOLLOWING GROUPS WERE REQUESTED

GROUP IDENTITY =	SPC001	DAFSC 20430	APR INTELLIGENCE OPNS SPECIALIST	CONTAINING	152 MEMBERS.
GROUP IDENTITY =	SPC002	DAFSC 20450	INTELLIGENCE OPERATIONS SPECIALIST	CONTAINING	401 MEMBERS.
GROUP IDENTITY =	SPC003	DAFSC 20470	INTELLIGENCE OPERATIONS TECHNICIAN	CONTAINING	327 MEMBERS.
GROUP IDENTITY =	SPC004	DAFSC 20490	INTELLIGENCE OPERATIONS SUPT	CONTAINING	61 MEMBERS.
GROUP IDENTITY =	SPC005	DAFSC 20630	APR PHOTO INTERPRETATION SPCL	CONTAINING	48 MEMBERS.
GROUP IDENTITY =	SPC006	DAFSC 20650	PHOTO INTERPRETATION SPECIALIST	CONTAINING	377 MEMBERS.
GROUP IDENTITY =	SPC007	DAFSC 20670	PHOTO INTERPRETATION TECHNICIAN	CONTAINING	204 MEMBERS.
GROUP IDENTITY =	SPC008	DAFSC 20690	PHOTO INTERPRETATION SUPERINTENDENT	CONTAINING	22 MEMBERS.

VARIABLE NUMBER= V014 = TOTAL MONTHS IN PRESENT WORK ASSIGNMENT

INTERVAL		SPC001	SPC002	SPC003	SPC004	SPC005	SPC006	SPC007	SPC008
1	12	144	316	206	37	43	272	147	13
13	24	3	60	74	13	4	78	29	6
25	48	0	19	40	10	0	22	22	2
49	96	0	1	4	0	0	1	1	1
97	144	0	0	0	0	0	0	0	0
145	360	0	0	0	0	0	0	0	0
TOTAL COUNTED		151*	396*	324*	60*	47*	373*	199*	22*
OTHER		1	5	3	1	1	4	5	0
MEAN		5.0199	9.9359	12.2809	13.4000	5.2766	9.3592	11.2462	14.5000
STD DEVIATION		3.0043	7.8080	10.5309	9.7146	4.0079	8.2038	9.4664	16.9458

VARIABLE NUMBER= V022 = ASSIGNED BY A BYPASS TEST (1=YES, 2=NO)

INTERVAL	SPC001	SPC002	SPC003	SPC004	SPC005	SPC006	SPC007	SPC008
1	3	9	11	0	2	3	0	0
2	149	390	312	60	46	372	204	22
*	0	2	4	1	0	2	0	0
TOTAL COUNTED	152*	401*	327*	61*	48*	377*	204*	22*
OTHER	0	0	0	0	0	0	0	0

VARIABLE NUMBER= V023 = ASSIGNED BY CLASSIFICATION BOARD ACTION (1=YES, 2=NO)

INTERVAL	SPC001	SPC002	SPC003	SPC004	SPC005	SPC006	SPC007	SPC008
1	6	12	38	14	0	5	8	0
2	146	387	285	46	48	370	196	22
*	0	2	4	1	0	2	0	0
TOTAL COUNTED	152*	401*	327*	61*	48*	377*	204*	22*
OTHER	0	0	0	0	0	0	0	0

VARIABLE NUMBER= V024 = ASSIGNED AT COMPLETION OF BASIC TECHNICAL COURSE (1=YES, 2=NO)

INTERVAL	SPC001	SPC002	SPC003	SPC004	SPC005	SPC006	SPC007	SPC008
1	16	154	134	15	33	270	126	13
2	136	245	189	45	15	105	78	9
*	0	2	4	1	0	2	0	0
TOTAL COUNTED	152*	401*	327*	61*	48*	377*	204*	22*
OTHER	0	0	0	0	0	0	0	0

COLLECTING, ANALYZING, AND REPORTING INFORMATION DESCRIBING JOBS AND OCCUPATIONS

Discussion

Gary B. Brumback
United States Department of Health, Education, and Welfare

Reliability of Occupational Information

Dr. Morsh reports that a job incumbent's inventory responses are essentially in agreement when they are collected on two occasions. This is a minor comment to be making, but I would guess that Dr. Morsh's highly structured inventories materially aid an incumbent's recall. I am curious to know if Dr. Morsh has studied test-retest reliabilities of standardized job inventories in which the items are scrambled throughout the checklist.

Generalized Job Descriptions

Dr. Morsh obtains more generalized job descriptions by summing the percentages of time spent on tasks subsumed under a given duty. An alternative procedure would be to ask incumbents to estimate directly the relative time spent on each duty. These estimates could also be compared with the sums of task percentages for a measure of internal consistency.

Job Attributes and Measurements

The job attributes selected for study and how they are measured (tasks and ratings of relative time spent respectively in Dr. Morsh's studies) will naturally affect the results of any job analysis; and the purpose of the job analysis helps to determine what attributes and measurements are selected. On a project at HEW, we wrestled with the question of attributes and measurements for some time.

Because the purpose of our job analysis was to identify for incorporation in a new performance evaluation instrument the broad work functions which cut across professional groups, duties rather than tasks performed were chosen as the primary attribute for study.[1] We constructed our checklist of duties after pouring over more than 4,000 narrative billet descriptions on record for our Commissioned Officers in the United States Public Health Service. I would like to mention that one of our most difficult steps was in abstracting specifically written activities to the more general level of duty. And if we ever have to do that again, we will somehow establish more objective procedures for deciding when an item describes a duty and not something else.

While incumbents can probably more objectively estimate relative times spent on tasks, we felt such a measure would not be comprehensive or appropriate enough for professionals, scientists, and administrators. For example, long range planning may assume a relatively small portion of an administrator's time, but still be a crucial activity in terms of program accomplishment. Since we did not wish to burden our officers with a request for more than one type of rating, we finally settled upon ratings of the significance of each duty performed. We defined significance in terms of the Officer's composite judgment of time spent on the duty, its frequency of occurrence, and its importance in meeting the objectives for which the position was established.

It would be interesting and worthwhile, it seems to me, to conduct a comparative job analysis in which all possibly relevant work-related attributes and ways of measuring them are tried on the same jobs. I suspect, for example, that significantly different factor structures would result from separate factor analyses of relative time spent vs. significance ratings for higher level, more complex jobs, but not for the more routine ones.

Factor Analysis of Duties Performed

The comment I wish to make here is not a direct response to Dr. Morsh's work, but has a bearing on many job analyses. The majority of factor analyses of work-performed data are done on very homogeneous samples of jobs. In our study at HEW, the sample of 3,719 positions was quite heterogeneous by comparison, and consequently some of the distributions of our significance ratings of duties were markedly skewed even though we were dealing with general instead of specific work activities. That is, we found that there were some duties performed by only a small percent of the Officers.

[1] Brumback, G. B. and Vincent, J. W. A factor analysis of work-performed data for a sample of administrative, professional, and scientific positions. In Press. *Personnel Psychology*, 1970, 23, Number One.

I don't want to dwell on the skewness problem here because it is the subject of a technical paper I am now working on, but I mention it because our factor structure had such satisfactory content validity, and because it appears that other properties of that structure and of the underlying intercorrelation matrix were not substantially affected by the skewness problem. At the very least, we can say that our factor analysis results were invaluable in determining the basic content of a new performance evaluation instrument.

The United States Air Force Job-Clustering Program

Dr. Raymond Christal was very kind and had our Officers' jobs clustered by this automated program. Before the clustering was started, I expected someone at HEW to ask me what the results would show that couldn't be guessed beforehand since we were dealing with rather well-known quantities at rather general levels of description. I was prepared to answer that it would be difficult to pinpoint in every case which position belonged to what group even if the types of groups were known in advance. As it turned out, a staff pharmacy group emerged from the clustering which was entirely unexpected.[2] This was the only group that did not cut across professional boundaries. Moreover, this group comprised a very small number and narrow spectrum of duties. And the group's emergence could not be attributed to items included in the checklist that were specifically peculiar to pharmacy. Therefore, had the clustering not been carried out, the performance evaluation instrument which we subsequently built and are now validating would surely have been less comprehensive in its coverage.

Theoretical Applications

Dr. Morsh does not mention the theoretical applications of the methods and results of job inventorying and clustering which I believe merit a brief discussion here. We have seen various theories espoused to explain various realms of the world of work; theories about organizations, about leadership, about motivation and morale, about performance, etc. As at least one focal point in this world, man's job and what he does on and with it are both independent and dependent variables to be manipulated and measured for theoretical as well as practical gains. Take role conflict theory, for example. Inventories of ideal and actual jobs filled out by incumbents and by persons with other perspectives, such as superiors, associates, clients, could lead to measures of self-conflict and divergencies of expectations within the work milieu. As another example, how jobs are clustered over time and in varying situational conditions could contribute to theories of organizational change. As a final example, job studies could help determine whether successful leaders are effective partly because they are able to change the very nature of their positions when the conditions call for it. It would be very instructive to examine the literature of theoretical writings and their empirical tests to see where job studies and results have had an incisive impact.

The History of Occupations

Needless to say, the occupational makeup of a society is affected by changes in economic as well as other conditions. What Mr. Lewis' treatment of the evolution of the UST&ES served to remind me of was that job analysis methodology has been responsive to these conditions also. While an adaptive methodology is necessary, unless there are some constants running through the technology over the years, when we wish to study the history of occupations, we find ourselves looking at change with changing tools and concepts. I wonder, for example, if it would be next to impossible for the UST&ES to delve into its records from the Depression onward in order to estimate how given occupations have changed in their profiles of the five categories of job information now considered necessary for complete job analysis coverage.

Perhaps there should be in job analysis an underlying conceptual framework independent of any particular economic condition, user need, and state of the art and to which we would refer before taking another slice of the occupational domain. By so doing, we might be more assured of representing the fundamental dimensions over time.

Restructuring of Occupations in the Health Professions

I certainly tend to agree with Mr. Lewis that job restructuring may be the most useful application of job analysis methodology and data in recent times. In this regard, I should like to make several *personal* observations about the health professions. First, job analysis is a

[2] Blumback, G. B. and Vincent, J. W. Establishing position families for a performance appraisal system. (Publication pending).

Johnny-come-lately for these professions. But I do not want to occupy space here to add some interesting conjectures as to why this may be so. Second, the health professions are in a bind in which the demand for services has conspicuously outstripped the supply. Third, I think we are going to start hearing more about attempts to shift some of the more routine, back-breaking demands away from physicians and others to paramedics. Think for a minute, for example, of the one or two physicians who are providing the only general practice of medical services to a rural community of 10,000 people. For such a community in the not-so-distant future, there may be a mobile cadre of paramedics who will initially practice a restricted form of medicine in emergency situations, but who undoubtedly will eventually expand into areas of preventive medicine as well. Fourth, the import of these times and conditions for job analysis and job restructuring in the health professions seems clear. Hopefully, the shifting of traditional responsibilities will not just happen and with uncertain consequences, but will instead evolve effectively from a planned approach based partly upon a body of more accurate and thorough knowledge of the manifold structure and content of occupations in the health field.

Survey of User Needs for Occupational Analyses and Reports

I was most impressed with Mr. Meyer's well-planned and conducted survey of user needs prior to the design of the Army's MODB. I am responsible at HEW for determining the application of the job analysis and clustering techniques used in our performance appraisal research to various other functional areas within personnel administration. I am now seriously considering adopting Mr. Meyer's survey techniques as a means of determining what would be the requirements and uses of an occupational data bank for HEW.

Return Rate of MOS Survey Questionnaires

Mr. Meyer reports a return rate of over 70% for the job questionnaires that are administered and collected through a chain of command on soldiers located world-wide and in a particular MOS. Assuming soldiers in combat positions are not included in the survey, a 70% plus rate, although it may be sufficient, seems surprisingly low to me in view of the command route taken. Upon learning of this Army experience, I feel moved to express again my gratitude to the 70% plus of our PHS Commissioned Officers who voluntarily completed a 16-page position inventory for the first phase of our performance appraisal research project. We sent two follow-up letters to our sample which definitely increased the return rate.

COLLECTING, ANALYZING, AND REPORTING INFORMATION DESCRIBING JOBS AND OCCUPATIONS

Discussion

Lt Colonel R. R. Van Cleve
United States Marine Corps Headquarters
Washington, D. C.

The Marine Corps has under development a Task Analysis Capability. We have not reinvented the wheel. We have looked at all of the current systems sponsored by you gentlemen and others. The progress we have made can be attributed to the beneficial suggestions and ideas gained from you, and at this time I would like to thank you. During the planning for the current Marine Corps program, we did some historical research and came upon a couple of significant documents. The first is a memorandum from Joint Chiefs of Staff to Secretary of Defense dated August 1949 which stated:

> Initiate a study to determine the most appropriate methodology and techniques of military job analysis and job evaluation; determine the extent to which the unilateral analyses accomplished to date are valid with relation to methodology; provide for such further job analysis as may be required; and initiate a study to relate all Army, Navy, and Air Force jobs to a common occupational structure.

The Secretary of Defense forwarded a paper to the Chairman, Personnel Policy Board to institute the program recommended by the Joint Chiefs of Staff. It stated:

> Present mobilization plans are based on the promise that during an emergency, the manpower resources of the nation will be allocated between the Department of Defense and the civilian economy on the basis of need. It is expected that "rationing" will be confined to a limited number of "critical" occupations. Implicit in this concept, however, is the idea that each group must present *proof* of its needs for such manpower. Such proof can be best presented by the Department of Defense only after job analysis of military jobs. . . .

The Marine Corps commenced its formal task analysis efforts then. There were officers and enlisted personnel assigned to the effort on a world-wide basis. Their job was to collect job data correlate it to what was then the job structure, and develop recommendations to revise the structure. As a result of this effort the Marine Corps converted from the Specification Serial Number to the more descriptive Military Occupational Specialty Coding System. Stringent fund, manpower ceilings, and the Korean War soon caused the curtailment of this program.

Later in 1958, the Marine Corps conducted a billet analysis of the entire job structure. Analysts drawn from various commands were trained and commenced the data gathering process. The magnitude of the data and the lack of mechanized capabilities resulted in a long drawn out summation and analysis effort. Improvements to the job structure were derived from this operation. It soon became apparent, however, that the program was beyond the then current state of the art and not the most cost effective program.

However, not all of the Marine Corps Task Analysis efforts can be categorized as historical. Certain efforts are on-going today. As directed by the Department of Defense and under the sponsorship of the Assistant Chief of Staff, G-3, the Revision of Electronics Training Courses Analysis Project (RETCAP) was initiated at Communications-Electronics School Battalion, Marine Corps Recruit Depot, San Diego, in August 1968. An analysis of Occupational Field 28 (Telecommunications Maintenance), by observation, is currently underway. Occupational Field 59 (Electronics Maintenance) will be analyzed upon completion of the OF 28 effort.

The objective of this study is to review the syllabi of certain electronics training courses that support Occupational Field 28 (Telecommunications Maintenance) and Occupational Field 59 (Electronics Maintenance). This review is to use actual job data as a basis for revision to the courses.

A task group of seven officers has been assigned to this effort. At Annex A is an overview of the number of incumbents in each MOS and the number of marines interviewed in connection with this data accumulation process. The task group is now formulating the task statements, completing a mechanized analysis program, and developing

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procedures to review the data in conjunction with the current training syllabi. It is anticipated this project will be completed during November 1970.

Where does the Marine Corps stand today in job analysis notwithstanding the overview I just provided in the Electronics Training Course Project?

In December 1968, Dr. Christal was in the Washington area and presented a group of marines an overview of the Air Force Job Analysis System. The advanced state of the art demonstrated by Dr. Christal was most impressive and caused the Marine Corps action officers to review the current plan which was a research and development project to determine the organization, procedures, processes, and equipment necessary to institute a Task Analysis Program.

In January 1969, two officers were dispatched to Ottawa, Canada, to review the job analysis program operated by the Canadian Armed Forces under Commander Cormack. This was a business trip and not a folly as Ottawa is not the place to journey to in January of any year unless you are a most ardent ski buff. Commander Cormack provided a finite outline of the Canadian Forces Program, recommended detours around certain problem areas, described the critical areas, and displayed an expression of confidence that the military establishment was susceptible to task analysis from infantrymen to helicopter pilots. The Marine Corps action officers were convinced the Marine Corps did not need an expensive R&D project (estimated $200,000) to tell us what we needed.

A briefing was prepared and a recommendation submitted to the Assistant Chief of Staff, G-1, to delete the R&D effort and commence the establishment of a Task Analysis Organization. The organization would be under control of the Assistant Chief of Staff, G-1, and be organized as indicated in the attached Appendix. The recommendation was approved and action was taken to institute the program. The nucleus of the organization has been established and the team members will commence reporting for duty in October 1969. The plan calls for the complete analysis of the job structure in three years. The organization's efforts will commence with three small well defined work areas: Occupational Field 15 (Lithography), Occupational Field 23 (Ammunition and Explosive Ordnance Disposal), and Occupational Field 31 (Transportation). A plan has been outlined that will consume approximately four months from the date team members report for duty to the completion of the first occupational field. The plan is:

1. **Train the Analyst.** This will include indoctrination on the Washington area, detailed instruction on the procedures, the mechanized processes and the administration of the program products.

2. **Plan the Analysis.** The team members will be immersed in the technicalities that cause that particular occupational field to function. Identifying, obtaining, reviewing, and extracting pertinent data from publications will be the major task. This research will include but not be limited to: (a) Number of billets and their location, (b) Number of Marines by grade, (c) The training structure, (d) Reference materials utilized by job incumbents in daily work performance, and (e) Identification of equipment used or worked on to include nomenclature and technical jargon.

3. **Inform Commands.** Each command that will be visited by team members will be informed of the forthcoming visit and their responsibility to the team.

4. **Observe the Job Incumbents.** Team members will depart for the field commands. A briefing for each commander and selected members of his staff will be held. The briefings will be standardized by using the Kodak 35mm Carousel Projector and a prepared outline. A briefing by the command personnel officer will then provide the team members with the employment peculiarities of the job incumbents at that command. After selecting the job incumbents the analysts will commence the inquiry. Dictaphone equipment will be used to record the queries and responses; thus, the analysts will have a ready first-hand history information file upon which to base their decisions on task statements. Rough task statements can be derived in the field, placed on dictaphone tape and mailed to the Washington office for recording on the Magnetic Tape Selectric Typewriter in rough format. This will help reduce the administrative time in preparation of the task list.

5. **Prepare Inventory of Tasks.** The analysts, individually and in concert, will develop task lists. The content of the task statements will be the result of discussion and agreement by a majority of the group who were involved in the data gathering. These lists will be prepared, routed to the cognizant technical manager in HQMC and then revised accordingly. Concurrent with the HQMC review, copies will be distributed to personnel at Washington area commands to derive comments and recommendations relative to clarity, technical content, and format. Corrections as necessary will be made utilizing the Magnetic Tape Selectric Typewriter in its labor saving role.

Sufficient copies of the task list will be prepared for administration to the selected sample.

6. **Administering the Inventory.** The team will return to the field to administer the inventory. The responses to the inventory will be recorded on scannable forms that are divided into three parts: (a) personnel background data; (b) technical background data; and (c) the task statements. The technical background data will be different for each analysis conducted, therefore, we have developed a response form that has multiple response formats. By selecting questions and directing the respondent to a particular format, the responses can be tailored to the occupational field being analyzed. The responses will be accumulated, returned to Washington, processed through the Farrington 3030 scanner, and transferred to magnetic tape for processing on the IBM 360/65.

The first part of the Marine Corps job analysis program has been patterned after the Canadian Force program. Now the United States Air Force contribution should be mentioned.

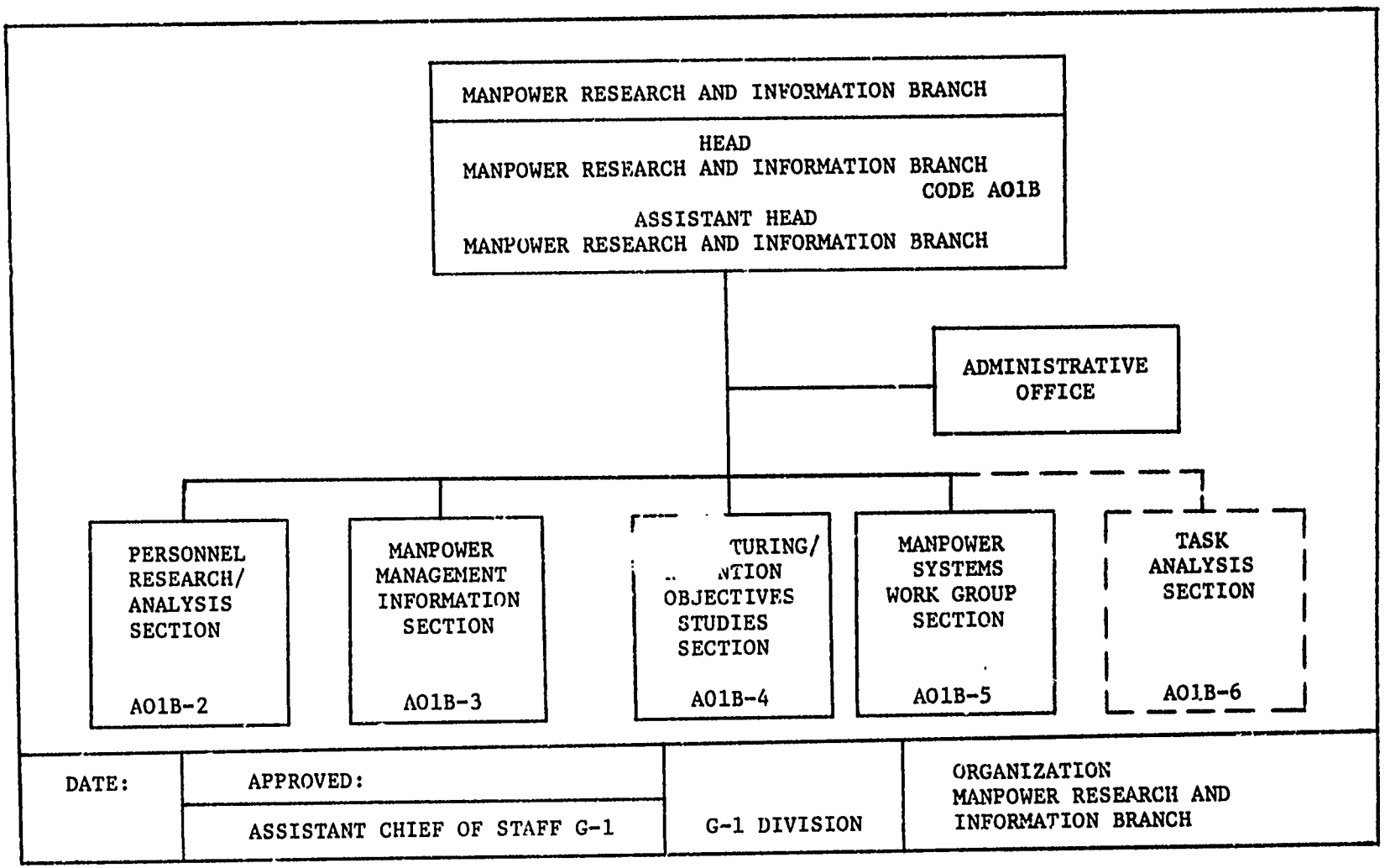
In May 1969, Marine representatives went to San Antonio and discussed the Air Force's Computerized Occupational Data Analysis Programs (CODAP) System with Dr. Christal. He provided a copy of the CODAP Operations Manual and the names of two individuals responsible for the program: Mr. Jim Hills and Mr. Irwin Oates of Houston, Texas. The Marine Corps has established a sole source contract with Messers Oates and Hills to adapt the Air Force program to Marine Corps requirements. This contract work is now under way. It is anticipated the total CODAP System will be adaptable through a three-phase program. The first phase will be completed during November 1969.

This flexible data processing system will provide the Marine Corps with the capability to establish input and history files and do an analysis of the job structure. The initial production output, though somewnat limited as compared to Air Force Analysis System, will be expanded during phase II and III of the contract. The Marine Corps will then be able to evaluate the content of training courses, the job structure hierarchy and such other matters that relate to classification and assignment of marines with the job data accumulated and processed in the early phase of task analysis The Marine Corps has a long way to go in Task Analysis and there is much to learn. However, with the fine cooperation received in the past – extended into the future – the Marine Corps will become a source of improvements to the state of the art, just as you gentlemen have been in the past.

	2811	2812	2813	2814	2815	2816	2817	2831	2841	2847	2851	2857	2861	2865	2867
See Note #1. MARINE CORPS TOTAL	248	21	34	85	278	36	51	461	760	249	353	8	329	UNK	19	2932
NUMBER INTERVIEWED	27	1	0	6	28	3	6	44	82	28	32	2	18	1	6	284
PERCENT INTERVIEWED	10.8	4.8	0	7.1	10.2	8.4	11.9	9.6	10.9	11.3	9.1	25	5.5	UNK	32	9.7

	5931	5932	5941	5942	5943	5944	5949	5961	5973	5975	5976
MARINE CORPS TOTAL See Note #2.	327	19	56	55	41	124	156	108	62	52	25
NUMBER INTERVIEWED	0	0	3	7	3	6	*11	5	8	5	3
			*2	*1	*4	*3	1				
PERCENT INTERVIEWED	0	0	5.4	12.7	7.3	4.8	7.1	4.6	12.9	9.6	12.0
			*8.9	*16.0	*17.1	*7.3					

* First term enlistees who have obtained MCS by virtue of promotion and have not attended the Aviation Technician Course.


MANPOWER RESEARCH AND INFORMATION BRANCH
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ASSISTANT HEAD
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ADMINISTRATIVE OFFICE
PERSONNEL RESEARCH/ ANALYSIS SECTION
A01B-2
MANPOWER MANAGEMENT INFORMATION SECTION
A01B-3
TURING/
NTION
OBJECTIVES STUDIES SECTION
A01B-4
MANPOWER SYSTEMS WORK GROUP SECTION
A01B-5
TASK ANALYSIS SECTION
A01B-6
DATE:
APPROVED:
ASSISTANT CHIEF OF STAFF G-1
G-1 DIVISION
ORGANIZATION
MANPOWER RESEARCH AND INFORMATION BRANCH

APPENDIX I

HEADQUARTERS BATTALION, HQMC USMC T/O 5150

LINE	BILLET DESCRIPTION	RANK	MOS	NOTE	PAP	AUTHORIZED NA/CIV	AUTHORIZED AG/OFF	AUTHORIZED ENL	WPN	Off	Enl
	TASK ANALYSIS SYSTEM SEC										
	HEAD	LT COL	9911		V				P	1	
	ADMIN OFFICER	WO	0130		V				P	1	
	ADMIN CHIEF	SSGT	0141		V				P		1
	PROGRAMMER	SGT	4071		V				M		1
	CLERK/TYPIST	GS-3	0322			2					
	ANALYST TEAM 1										
	TEAM LEADER	MAJ	0302	A	V				P	1	
	SECTION 1 LEADER	CAPT	0302	B	V				P	1	
	ANALYST	MSGT	0141	*	V				P		1
	ANALYST	MSGT	0211	*	V				P		1
	ANALYST	MSGT	0369	*	V				P		1
	SECTION 2 LEADER	CAPT	0802	C	V				P	1	
	ANALYST	MSGT	0811	*	V				P		1
	ANALYST	MSGT	1349	*	V				P		1
	ANALYST	MSGT	1811	*	V				P		1
	ANALYST TEAM 2										
	TEAM LEADER	MAJ	2502	D	V				P	1	
	SECTION 1 LEADER	CAPT	2502	E	V				P	1	
	ANALYST	MSGT	2591	*	V				P		1
	ANALYST	MSGT	2811	*	V				P		1
	ANALYST	MSGT	3041	*	V				P		1
	SECTION 2 LEADER	CAPT	3002	F	V				P	1	
	ANALYST	MSGT	3311	*	V				P		1
	ANALYST	MSGT	3421	*	V				P		1
	ANALYST	MSGT	3516	*	V				P		1
	ANALYST TEAM 3										
	TEAM LEADER	MAJ	6202	G	V				P	1	
	SECTION 1 LEADER	CAPT	5905	H	V				P	1	
	ANALYST	MSGT	4021	*	V				P		1
	ANALYST	MSGT	5917	*	V				P		1
	ANALYST	MSGT	6212	*	V				P		1
	SECTION 2 LEADER	CAPT	6302	J	V				P	1	
	ANALYST	MSGT	6381	*	V				P		1
	ANALYST	MSGT	6711	*	V				P		1
	ANALYST	MSGT	7011	*	V				P		1

FOOT NOTES

A MAY BE FILLED BY ANY 03-08-13-18
B MAY BE FILLED BY ANY 01-02-03 CAPT OR CWO 2 or 3
C MAY BE FILLED BY ANY 08-13-18 CAPT OR CWO 2 or 3
D MAY BE FILLED BY ANY 25-30-34-35
E MAY BE FILLED BY ANY 28-28 CAPT OR CWO 2 or 3
F MAY BE FILLED BY ANY 30-31-32-34-35 CAPT OR CWO 2 or 3
G MAY BE FILLED BY ANY 62-63-67-75
H MAY BE FILLED BY ANY 59-62 CAPT OR CWO 2 or 3
J MAY BE FILLED BY ANY 63-67-70 CAPT OR CWO 2 or 3
* MAY BE FILLED BY ANY MSGT OR GYSGT WITHIN THE SPECIFIED OF

NOTE

PRO PAY WILL BE RETAINED WHERE APPROPRIATE

COLLECTING, ANALYZING, AND REPORTING INFORMATION DESCRIBING JOBS AND OCCUPATIONS

Discussion

Joseph Cowan
Chief, Personnel Planning and Programming
United States Coast Guard, Washington, D. C.

As one of the last discussants, I find myself in the position of wanting to say simply, "Me too – job task analysis is great stuff," and let it go at that. However, a little overkill and review won't hurt.

One problem in job analysis has been that of simulating in verbal form jobs which are composed of a large number of important, independent, and non-verbal job elements. Of course, there have been other difficulties – each job always differed in some respect from every other job. In addition, the traditional job descriptions did not readily relate to quantified personnel measures. However, despite these problems, psychologists discovered rather early in the game that job descriptions were of great value in classifying and grouping jobs. Job descriptions could be scaled in terms of job difficulty levels. Job descriptions indicated the aptitudes, experiences, and training elements required by the job. Accordingly, there was a strong tendency for researchers interested in the man/job/training and experience interface to focus on the common elements. Subjectively, intuitively, and insofar as possible, objectively, the pieces of information on jobs, people, training, and experience were formed into composites and the composites into systems. This process of abstracting and relating achieved great parsimony and yielded a cohesive, meaningful system of job descriptions, job taxonomies, personnel classification, instruments and procedures, and training programs which could be administratively utilized in manpower management. The paper by Lewis provides a perfect example of progress. Unfortunately, in the process of simplification and grouping in the traditional job analysis, much information is lost. Accordingly, job descriptions, training curriculums, and performance and aptitude tests frequently give the appearance of being unconnected pieces of the same jig-saw puzzle. For example, most research indicates that school performance and academic aptitude measures seldom relate to on-the-job performance measures. Curriculums based on job descriptions are continuously modified to correct for the inadequacies of previous graduates.

This leads me to the conclusion that, though traditional job analysis procedures are good, something is missing. Today we have heard about a new trend in job analysis which looks as if it will provide the missing elements. The trend is job task analysis made possible by utilization of questionnaires, computers, and new analytical procedures developed by Christal, Morsh, and others at Lackland Air Force Base and in other organizations such as the United States Army and the Canadian Armed Forces. This new trend promises to be a breakthrough. The new approach accounts for the most job elements in an objective and quantified manner.

The progress reported here today by Morsh, Cormack, and Meyer is impressive; but even more important is the potential of the job task procedure for further progress, especially in the interface between Psychological Research, Systems Research, and Planning, Programming, and Budgeting. The ability to evaluate job tasks in terms of: (a) frequency of events, (b) amount of time spent on job tasks, (c) criticality of the task, and (d) difficulty of the task, will be of value in relating costs to personnel actions. For example, it will be possible to develop training programs which fit the real-world requirements at acceptable costs. Accordingly, the training level can be optimized with full knowledge of the kinds, frequency and difficulty of job elements for which training has not been provided. The consequences of training restrictions can be estimated and compared with the cost of corrective action such as on-the-job training programs.

Furthermore, job task analysis can be used to develop better personnel testing instruments because it will be possible to better sample relevant job-knowledge elements and thereby provide better personnel measures for promotion and selection.

The job task procedure permits the development of new job classifications with the promise of better and more meaningful structuring of grade levels and job families to fit available

manpower resources. Also, the procedure permits matching individual experience with job requirements; and accordingly, can provide for greatly improved assignment procedures.

Dr. Morsh pointed out in his paper, the Air Force job task procedure is economical and comprehensive; and despite all the other advantages, it is the consideration of "can we afford it?" which was critical when the Coast Guard decided to become involved with job task analysis. I might add in closing that I was pleasantly surprised to find that despite the volumes of personnel research data which are published every year, the Canadians, the Israli Armed Forces, the United States Army, Navy, and Marine Corps, and yes, the Coast Guard, have all been on top of these promising United States Air Force developments for some time with full intent of taking advantage of them as conditions permitted. This rapid response certainly is an indicator that: (a) well directed research can pay off, (b) there are many sensitive, alert, and aggressive psychologists around who are willing to capitalize on a good thing, (c) organizations are responding to their psychologists and accepting changes in personnel procedure, and (d) our publication/conference/convention system is operative in spreading the good word.

COLLECTING, ANALYZING, AND REPORTING INFORMATION DESCRIBING JOBS AND OCCUPATIONS

Discussion

Ernest J. McCormick
Professor of Psychology
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I can remember, in the days gone by, symposia and other gatherings related to job analysis when the prevailing mood underlying the surface veneer of expectancy was one of despair, gloom, and dejection - or at least one of mutual head-scratching about what ought to be done. In contrast, in this, and other relatively recent gatherings of the clan, we hear people talking about what *has* happened or *is* happening, rather than bewailing the present state of affairs, or speculating about what should be done in the future. This shift, it seems to me, has occurred in a period of really not too many years. In the years gone by, job analysis was perhaps something of an art in the sense that descriptive material about jobs was presented in verbal form, hopefully in a manner that would lend understanding to the reader. And I might add, incidentally, that some people are able to ply this art very well, while others cannot. Needless to say, such descriptive material relating to jobs and occupations has been, and will continue to be, of significant value in various and sundry contexts. However, for many purposes one wishes to deal systematically with job information - to apply some of the precepts and approaches of science to the field of human work. Any kind of research effort relating to people, the weather, tomatoes, or jobs, requires the identification or the measurement of relevant characteristics of the thing being investigated, in order that variations thereof can be expressed either in terms of categories or quantities. Actually, I was stretching a point a few moments ago, implying that no such systematic, scientific approaches had been applied to the field of human work until recently. The fact that my comments were exaggerations is of course demonstrated by some of the early work of Viteles in the development of the psychograph, some of the early work of the United States Employment Service in connection with the Occupational Characteristics Check List and other schemes, the development of the Minnesota Occupational Rating Scales, and the very extensive activities in the field of job evaluation (in which jobs are systematically evaluated on each of many different factors).

However, I think that all of these (and perhaps other) approaches depended dominantly upon the rating of jobs in their totality. (This is not to say that one should be against the use of such rating processes; I would be in a flimsy position to argue against such ratings, since I have engaged in this practice many times myself.) I think the thing that has been added to the brew in more recent years is the greater emphasis of the general approach of looking at human work in terms of *units* of human work. (Even here we need to take cognizance of certain previous efforts, in particular the work of the industrial engineers in motion and time study; they became involved in the dissection of work many years before the psychologists started to be concerned with such analysis, although that approach was of course a very microscopic one.) To see what there is in common between the butcher, the baker, and the candlestick maker one should not look at the ham hock, the loaf of bread, or the candle. Rather, one needs analytically to examine the specific activities that are involved in producing these items.

In this connection, I would like to harp softly on a theme that I have played before, in which I have tried to make the admittedly rather tenuous distinction between job-oriented activities and worker-oriented activities. The line is a rather thin one, but in the description of job-oriented types of work activities, the "units" of behaviors are those, that, in effect, characterize work activities in essentially operational or technological terms, perhaps characterizing the end result, or the consequence, of the activity - such as removing a carburetor, placing the bread in the oven, completing a particular form, galvanizing a sheet of metal, and so forth. On the other hand, what might be thought of as worker-oriented variables are those that are more behavioral in nature (or that have strong implications in terms of human behaviors). Perhaps, in particular, these can be set in the framework of the conventional stimulus-organism-response paradigm, or, expressed in other terms, in terms of information receiving, mediation processes, and action or response processes.

I think that this confab has reflected very persuasively the fact that very significant inroads have been made in the direction of developing procedures for identification of the work activities of people, especially in terms of what I have referred to as job-oriented variables. The extensive work that has been done over recent years (particularly sparked by the work of the Personnel Research Division, Lackland Air Force Base) is a manifestation of the progress that has been made, involving the use of what are variously called job inventories, task inventories, job check lists, and so forth. Here, the central attack has been that of trying to identify those units of job activities that can be "identified" with reasonable reliability, frequently supplemented by procedures for "rating" the activity in terms of some relevant variable such as the time devoted to the activity, its importance, and so forth. Associated with this approach is its dominant dependence upon self-report by job incumbents. The fact that this can be done by people of various levels of education and intelligence is itself a very significant facet of the use of this type of instrument.

The use of this approach to the collection of job information has two major advantages. In the first place, data so collected can be dealt with in a quantitative manner, thus lending itself to many different practical uses. And in the second place, the possibility of having individuals describe their own jobs, in turn, makes possible the collection of tremendous quantities of occupational information with relatively nominal effort (at least on the part of the collector). This combination seems to offer substantial promise for certain uses outside the military services. For example, to repeat a suggestion I have made in a different context once before, it seems to me that in the operation of the offices of the various state employment services, it would be possible to have people in each of various common career fields (such as the trades, certain clerical operations, and so forth) describe their own work activities using essentially a job inventory. In turn, it would be possible for vacancies to be described in terms of the activities that would be required. This might even lend itself to ready matching of individuals and positions on the basis of appropriate computer programs. (In fact, in some work we have been doing with job inventories recently, we explored this kind of "matching" of people with positions, the results being very encouraging.)

And I might add, on the other side of the coin, we have been fiddling around somewhat with the concept of worker-oriented job variables. In this connection, a job analysis instrument that we call the Position Analysis Questionnaire, has been used as the basis for the identification of various "job dimensions." Further, we have found that some combination of the behavioral job elements of this questionnaire result in correlations of .83 to .90 with going wage or salary rates. In addition, we have been able to develop – strictly on the basis of a systematic job analysis procedure – methods for the establishment of job requirements that specify the levels of each of various attributes that presumably would be required for successful job performance. This system needs to be tested further, but present indications are that such synthetically-derived job requirements probably have substantial validity.

Clearly, the progress that has been made in these directions in recent years does not lead to the end of the road. But I think it is encouraging that within a span of several years it has been possible to shift tenses from talking about the future, to talking about what has actually taken place, and what is taking place, in this rather boggy domain of the study of human work.

COLLECTING, ANALYZING, AND REPORTING INFORMATION DESCRIBING JOBS AND OCCUPATIONS

Discussion

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In the papers which have been presented here this morning, the speakers have given us a wealth of information which is both new, interesting, and thought provoking. It has been most interesting to hear this discussion because of the special problems which the Navy has in this field. I am honored to have the privilege to comment on their remarks. In view of the splendid papers we have heard, my comments cannot be anything but complimentary.

Regardless of any complimentary intentions, however, it must be recognized that the papers presented today reveal the extraordinary developments which have occurred in recent years in the field of occupational analysis. Implicit in all the work described is the re-fashioning of purposes, the re-structuring of procedures and the utilization of new tools. All this is profoundly impressive. Indeed, one of the awesome sights on the contemporary scene is that of a military or bureaucratic organization breaking out of the bounds and shackles of tradition to provide a significant and more comprehensive service.

We all know the classic procedures of occupational analysis. One man watched and noted the actions of another man at work on his job. The actions of both men were biased, and the resulting information varied with the wind, especially the political wind. But the information got to the personnel manager who used it to jog his memory when he was hiring other people

How refreshingly different were the procedures which we heard described. One common characteristic was that the occupational information was intended to serve a number of different purposes for different people. This is a most encouraging development. It shows a trend which is further seen in the procedures coming into common use. The evolution of a means for obtaining job information without requiring observation of the incumbent or verbalization by the job incumbent must be viewed as a very important development. The use of experienced personnel to generate information about a type of job serves both to clarify and to validate job information.

Especially significant is the increasing scope of the kinds of relevant information which are being obtained. In addition to getting more precise information about *what* is being done, we are devoting more and more effort to discovering what must be done *before* the job is done. That is, we want to know what the job requires of the worker, what abilities of mind and body, what characteristics of personality, and what wisdom tempered by experience he must bring to the job. We want to know whether and what adjustments must be made to the environments to ensure satisfactory job performance.

On the other side of the job sequence, we want to know the end results of the work *after* the job is done, what products are put together, what services are rendered. The United States Employment Service is to be commended for its' study in this area. Indeed, the military services might find that further investigation here would put to rest the widespread conviction that their work is essentially non-productive.

Bearing in mind the expanded purposes for which occupational information is intended, and the broadened areas in which information is obtained, the papers we have heard have shown us through their precision, their clarity, and their broad scale of operation, that the concept of job analysis is undergoing extensive amplification.

From a minor, oddly shaped, unwieldy-to-operate tool in the personnel manager's tool-box, it is emerging as becoming a significant, widely relevant, readily operable system in the battery of resources of those who are charged with the management and utilization of manpower.

Now, someone might ask, "So what else is new?" My reply is – I realize that all of us are familiar with these developments. But I believe they need to be stated, and I believe their significance is such that they deserve the careful attention of other workers in the behavioral, industrial and engineering sciences.

Congratulation to the speakers for a job well done.

I know that the Navy is going to have to work like hell to catch up with them.

COLLECTING, ANALYZING, AND REPORTING INFORMATION DESCRIBING JOBS AND OCCUPATIONS

Comments by the Chairman

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Being Chairman of an APA Symposium is ordinarily a pretty good deal. You don't have to prepare a paper; you don't have to face the firing line when the discussants and audience get their turn; and you still get the lion's share of the credit. However, this symposium turned out to be a little different. Through what is yet an undetermined set of circumstances, I found myself with the problem of working four participants and five discussants into an allotted 50-minute session. I assure you it wasn't planned that way. Before the true situation came to light, I was worrying about getting everyone into the act during the anticipated one-hour and fifty minutes period.

Perhaps it all worked out for the best, since it led to this published report. In a sense, this guarantees that everyone gets his say, while making possible for a little less formality during the live session. I must thank all of the participants and discussants for their cooperation during a rather strained period, and I wish to give special thanks to Dr. Morsh, who, in fact, did most of the work in getting these papers together and published.

Since additional pages in a published report can in no way take time from the participants or discussants, I have taken the liberty of recording some observations and comments which came to me while reading the manuscript drafts. I hope I shall be forgiven for unfairly laying claim to "the last word." Also, I hope you will forgive the "breezy" style. Because of the late arrival of some of the papers, these comments had to be written in a single sitting, in order to meet the printing deadline.

First, let me react to the several brothers in sister services who gave kudos to Air Force researchers for our long-term efforts to place job survey methodology on a sound scientific footing. I want to set the record straight by admitting that this entire effort was undertaken within the Air Force over our "dead bodies." During the early and middle 1950's, several far-sighted and mission-oriented individuals at Headquarters USAF pleaded persistently for an occupational research project. The idea was routinely rejected by the research organization. Occupational Analysis was a dirty word. The problems were not researchable. The study of jobs was not the proper concern of those trained in the behavioral sciences. Our research techniques were not applicable. In late 1957, Headquarters USAF stopped accepting excuses and directed that an occupational research project be established. I can tell you now, that there were a lot of sick people then. The first year was a madhouse of confusion, trying to decide which way to go.

As it turned out, we couldn't have been luckier. The Headquarters USAF types were right and we were wrong. The problems were not only researchable, but the area was so virgin that even the results of what would be considered as mundane studies in other areas found ready acceptance. We were lucky in another way too. The collection of occupational data with job inventories was our first approach.

At the time, no one felt confident that job inventories would work. If we had taken a vote in 1958, I'm sure no one would have predicted that incumbents would provide as honest and reliable descriptions of their own jobs as subsequent studies reveal they in fact do. And they do it eagerly. We have had very few complaints from the 100,000 cases surveyed thusfar. Most individuals do not like to take tests; but the evidence is that they want to tell you about their jobs. Some because they are proud of what they do, and others because they think they have been given a raw deal.

Commander Cormack states that "men do not feel constrained in their answers if they know they do not have to pass their completed response booklets to their supervisors." This may be a key observation. The Air Force has found that better

information about the content of a job is obtained from an incumbent than from his supervisor. We know we get good information when inventories are administered by Test Control Officers and the results are forwarded directly to the analysis experts. We don't know what would happen if supervisors were placed in the review channel, but our guess is that the quality of data would go down.

It is apparent from Mr. Lewis' presentation that the Department of Labor does not now make extensive use of the job inventory approach. However, we should recognize the special problems such an undertaking might encounter. Individuals in the civilian sector may have something to lose by being honest, and something to gain by distorting the truth. Job classification and pay are often tied to job content. Also, I'm not sure that the unions would want management to have job information at the level of specificity which could be collected using inventories. I might add that we are currently surveying civil servants in several Air Force specialties, and in the not distant future we should be able to determine whether incumbents are honest when they might have something to gain or lose by the information provided. My personal feeling is that very few individuals will claim to perform tasks unless they in fact do so. The matter is too easily verifiable.

Several speakers addressed the problem of user acceptance. We also have faced this problem, and I would like to add a few comments. When users participate in the inventory construction phase, they often find themselves eagerly looking forward to the results and are prepared to use them. On the other hand, if one delivers an occupational survey report to a user and suggests that the results might assist him in making meaningful modifications to his program, often his first reaction will be to see if he can find something "wrong with the data." Without prior conditioning, there is a strong tendency for those in charge of training courses to look for evidence to lengthen training courses, while ignoring evidence to shorten them. (Even in the Air Force, we are still facing this problem to some extent.)

We find that users will not read occupational reports unless the data are organized. The actual task statements must appear as part of the job descriptions. No one will cross reference. The tasks also must be ordered on some meaningful dimension, such as "per cent performing," "frequency of performance," "time spent," or "criticality." I agree with Mr. Meyer that we have a problem with the bulkiness of reports being distributed. However, this is only a temporary problem. The solution will come with more efficient inquiry systems, analysis programs, display capabilities, and communication devices. In the meantime, we must teach our users how to interpret what they are receiving.

Several of the participants indicated how inventory results are being used to bring training courses "on-target." I would like to mention some important findings which have come to light in the Air Force. When we first began comparing inventory results against training courses, we felt that the most important contribution would be the identification of critical tasks which are not sufficiently emphasized in the curriculum. Such was not the case. The hardest information to come by is the identification of tasks being trained which incumbents are *unlikely to encounter on the job*. Trainers can ordinarily determine where additional training should be given, through the use of job evaluation teams and command surveys. However, it is extremely difficult for them to identify what training can be safely eliminated or reduced. An individual incumbent will recognize that he was trained on many tasks that he is not performing; but he doesn't know how many other men in his specialty in other jobs at other locations might be performing these tasks. There is no reason for him or his supervisor to raise a question about tasks being trained for, which are not being encountered at a given location. Fortunately, this is where inventory results really pay off. They report the exact probability that incumbents will encounter each task in the operational world.

In the Air Force, results from our early experimental surveys have already yielded high pay-offs. For example, Security Service modified one course which resulted in a validated cost savings of 1.06 million dollars. At the present time, modifications in another course are being prepared which will result in another million dollar savings. Note that these are per annum savings, which lead to large cumulated savings over time. They result from eliminating deadwood from courses – training on tasks which individuals are not going to encounter on the job.

The benefits realized by the operational commands from such changes are in the form of the additional man weeks of on-the-job work time yielded. In the latter example, the Air Force will

gain an additional 5,000 productive man weeks per year without changes in overall authorizations.

In other specialty areas, there are millions of dollars worth of less tangible savings being realized. In these instances, the total length of a training course is not modified, but it is redistributed. That is, training time is eliminated on tasks which personnel are not going to encounter, and is added to critical tasks which everyone is going to encounter. Savings in these areas are harder to put your hands on, but are nevertheless real. Money previously wasted is put to good use. At the present time, survey results are being used to bring six high-flow Air Force training courses "on target" in this manner.

If one projects the results of these experimental studies, it seems obvious that the Air Force will realize multi-millions of dollar savings, and will get multi-thousands of additional productive man-weeks, when it takes full advantage of the new techniques provided through occupational research.

In the face of evidence like this, it is difficult for me to understand questions like the one reported by Mr. Cowan: "Can we afford it?" With a view toward the obvious forthcoming cuts in funding of many governmental agencies, a better question in my judgment is "can we afford not to have it?"

I'm a little surprised that neither Commander Cormack nor Mr. Meyer reported any cost savings accruing from their programs. It makes me wonder if the trainers might not be, as suggested above, looking at the data with a biased eye. Perhaps some of their users are not yet ready to fully trust inventory data.

Let me provide two bits of information which might help in convincing trainers to accept the results of job surveys. The question is whether one can accept the finding that no graduates (or few graduates) will encounter certain tasks on the job. In the Army setting, where relatively small samples have been surveyed in some instances, this is a reasonable question to ask. Another way of putting it is: "If we were to go out and get a second sample, would we get the same results." A good answer to this question is provided in Appendix I. This Appendix reports the correlation between "per cent performing" and "time spent" vectors in independent samples for a variety of career areas. It may be seen that, when the samples are randomly drawn, the stability of the data is extremely high.

A second and even more impressive test was recently conducted in the Air Force, when a group of trainers refused to accept the validity of occupation survey results in their area, and set about to gather evidence that the data were in error. Now it should not be difficult to prove the error of a statement that nobody in the Air Force is performing particular tasks. Yet, at the end of their investigation they had to accept the inventory results as being valid. I don't mind telling you that we were "sweating this one out." But we now have greater confidence than ever, having passed the supreme test.

Moving on to another problem, all of the participants mentioned something about the use of occupational survey results in identifying changes needed in the classification structure. However, except to a limited degree by Dr. Morsh, it was not made clear how one goes about using the data to determine the changes to be made. I would like to make a few comments on this matter.

The first clue that a change in the classification structure is in order can be obtained from studying consolidated job descriptions. I have included the top portion of two job descriptions to make my point. Appendix II is a description of the work being performed by journeymen in the Weather Technician area. If you will scan down the first column of values in this Appendix, you will observe that there are a large number of tasks which nearly everyone in the occupational area is required to perform. Setting up a training course in this instance is fairly straight-forward, and it is immediately obvious that no matter what assignment an individual receives, he will make good use of his training. Now if you will study the first column in the description included as Appendix III, you will see that there is no easy way to establish a training course for Disbursement Specialists. There are only four tasks that as many as one-third of the graduates will encounter. If one teaches all of the tasks, 90% of the training will never be utilized. The problem is that there are many types of jobs included in a single management category. Any given individual performs only a very limited subset of the tasks encompassed by the occupation, as it is now structured.

The trick is to identify and define the *types* of jobs being performed, and to determine whether some of these types should be made into new management categories. There are a number of ways to approach this problem. The Canadians attempt to locate and give titles to job types before a job inventory is built. Then, as part of

their analysis output, they can produce more detailed descriptions of the work being performed by incumbents checking each title in their list. The Air Force, on the other hand, uses a completely different approach. A very complex and expensive analysis is executed by which individuals performing the same tasks are clustered, and a description of the work being performed by incumbents in each cluster is published. Job-Type titles are assigned after the fact, being based on job content. These two approaches need to be compared very closely. If the Canadian system really works, then the Air Force is going the long way around the barn.

Given that job types have been identified and described, the problem of determining which types of jobs should be grouped into a management category has to be resolved. A basic question to be answered is whether individuals who are proficient in performing a given set of tasks can quickly learn to perform a second set of tasks. In order to answer this question, we need to know something about the communality of qualifications requirements. Here is a place where I feel the Department of Labor might help the military services. They have a great deal of experience in identifying and making use of job requirement factors.

Of course, adjustments in the classification structure are not always a matter of identifying new management categories. Often a more meaningful question is whether two existing categories may be collapsed. The administration of multi-area inventories can greatly assist by pin-pointing the overlap between existing occupational categories. Again, the matter of determining the similarity of job requirements must be faced.

Now I would like to consider for a moment the two things which make the job inventory approach so powerful. The first has already been discussed, and that is the fact that incumbents are honest in checking those tasks which are in their present job. The technique is good – provided the task statements are well drafted. But I would like to dwell on the second thing that makes the inventory approach so beautiful, and that is this If a task inventory is complete, then every individual in an occupational area can define his job in terms of a subset of tasks in the inventory. It is fortunate that 300–500 task statements are normally sufficient to meet this requirement and still provide data at a low enough level of specificity to service user needs. The primary advantage of the task inventory approach over the use of trained analysts is that the resulting data are quantifiable. No two analysts will describe a job in exactly the same terms. The data they provide cannot be collated and tabulated. Being quantifiable, task data can be analyzed and reported by computer, and the resulting information can be verified using conventional analytic techniques.

I would like to mention some of the things I see in the future for occupational survey data. Dr. Morsh has already mentioned a few of these, but I feel they deserve more attention.

First is the matter of experience records. As Dr. Morsh mentioned, since every job in a career area can be defined in terms of a subset of tasks in an inventory, the inventory provides an excellent framework for establishing and maintaining experience records. To my knowledge, none of the services currently maintains experience records at the task level. In the Air Force a Jet Engine mechanic can spend months balancing jet rotors, but when he is transferred, all anyone knows is that he spent a given amount of time working as a jet engine mechanic at a given base. There is a danger that management will assume he received many maintenance experiences which he did not receive, and management does not know he received so much experience in performing the particular task of balancing jet rotors.

In the Air Force, we recognize many potential uses for experience records. As Dr. Morsh mentioned, they can be used to determine "force capabilities." That is, we will be able to determine the number of individuals in a career ladder who have had experience on each task. We also will be able to determine the extent to which individuals are being broadly experienced as they are sent from one job to another; or, to the contrary, to determine the extent to which they are being kept highly specialized. In some ladders we have indication that people are being kept specialized, even though specialties in the ladder are broadly defined. For example, there are dozens of job-types in the Accounting and Finance area. However, we find that if a man works in the travel pay shop at one location and is transferred to a new location, there is a high probability that he will be placed back into a travel pay job rather than to military pay, or one of the many other types of jobs in this career ladder. We feel that some day the Air Force should specify career plans in terms of the desirability of each individual having had certain experiences by the time he reaches each point in his career. Given jobs described at the task level, and experience records

maintained at the task level, it is conceivable that individuals could be reassigned so as to systematically expose them to new tasks in accordance with a properly defined career plan. The assignment system could simultaneously give weight to other matters such as PCS costs, job interests, past performance, and so on.

It would be of great practical utility if the Air Force had a way of quickly locating individuals who have had specified experiences. Such data would be especially useful in selecting individuals to man new bases being established in combat zones. In the past, the Air Force has tended to send its most experienced people into combat as soon as a flare-up occurs. Yet these are the same individuals who are most desperately needed as instructors in the technical schools, which are rapidly expanded to train new personnel coming on-board. With experience records, bases in combat zones could be manned so as to minimize redundancy of talent and experience.

The concept of maintaining a current description of every job and a current experience record for every individual may appear out of reach to some. But it is just a matter of technique development. The computer hardware for manipulating data at this level of specificity is already available.

It may be possible to establish experience records on the entire force through a "one-shot" administration of task inventories. If an individual can be trusted to tell you what he is doing at the present time, it is reasonable to believe that he may be able to tell you what he has been doing in the past. Of course, this matter needs to be researched, along with matters relating to the perishability and transferability of skills. The Air Force plans to undertake studies relating to the establishment and maintenance of experience records at the task level.

The time has come when the services must pay greater attention to the attitudes and satisfactions of their personnel. As we move closer to an "all volunteer force," this will become more and more apparent. Factors such as job satisfaction and felt utilization of talent should be considered as meaningful criteria in and of themselves, and we should immediately undertake studies to identify the job-related factors which contribute to individual feelings of being useful and productive.

I think that those of us who are collecting occupational data are in a unique position to conduct research on these matters. Take the question of job enlargement, for example. Researchers in a number of our major universities are attempting to conduct studies concerning the impact of job changes on worker attitude. However, these scientists are operating under severe limitations. It is not easy to get management in industry to experiment with changes in job content. Furthermore, when job content is changed, the unions may demand changes in wages, or the right to determine who shall be assigned to the newly organized job.

In the services, on the other hand, millions of personnel are reassigned each year. In some cases the new assignments entail additional responsibilities and a greater variety of tasks to be performed. In other cases, because of the loose combinations of jobs in our management units, the new assignments may actually result in a downgrading of responsibility. With job inventories as a tool, and with the capability of tracking individuals over time, we have every possibility of determining the impact of work assigned on job satisfaction and career decisions. And we can do it in a dynamic fashion. That is, we can relate changes in job content with changes in attitude.

In the Air Force, we have begun to pursue the job attitude problem. Already we can state that there are wide variations in job attitudes among individuals within the same area, and that there are significant differences in the average job attitude between occupational areas. We also can demonstrate that there are significant differences in the types of jobs being assigned individuals within a career area who express satisfaction or dissatisfaction with their work. At present, we are trying to untangle the complex interactions between the difficulty of job content, aptitude, and expressed satisfaction.

But these studies are only a beginning. I cannot think of a more interesting and potentially fruitful area for investigation, and I hope all of the services will join us in our search for methods to improve worker morale. I would like to quote from a recent letter addressed to the Air Force Times by an obviously dissatisfied serviceman:

> In the never-ending cry over retention and career motivation, the theme is generally fringe benefits, security and pay. Occasionally an issue is made of something really inane like the service number-social security number controversy. This merely reflects the lethargic unimaginative thinking which in the service all too often rewards.

> The key to retaining good people is job satisfaction. If one is thoroughly engrossed in and enamored of his work material rewards and benefits become secondary. It seems that the continued emphasis on material benefits is *de facto* admission that the services are so hard put to offer job satisfaction that they must resort to the "carrot and stick."
>
> . . . Men want to do what they feel is worthwhile. Until the services recognize and actively promote job satisfaction they will continue to be plagued by poor retention.

Mr. Cowan commented on the need to evaluate job tasks on such factors as difficulty and criticality. I'm sure we would all agree, although we might have a little trouble deciding on what we mean by such terms. If space permitted, I would discuss some of the Air Force efforts to develop task-factors. But I think it might be more profitable to describe one study which appears to be leading to a "breakthrough" in the near future. It has to do with the development of a method for measuring "job difficulty." First we had supervisors in one career ladder rank a larger number of jobs, described at the task level, in terms of their relative difficulty level. Difficulty was defined as the time necessary to learn to perform the job adequately, all other factors held constant. The inter-rater agreement for these rankings was quite high (r_{11} = .94). Next, we hypothesized 22 variables which might have been considered by the supervisors in making their judgments. We developed measures of these 22 potential predictors for each of the jobs in the original sample, and computed a series of regression equations to find those variables and weights which would replicate supervisory judgment concerning relative job difficulty level. Our final equation turned out to be extremely simple, as follows: $W_1X_1 + W_2X_2 - W_3X_3 + K$, where W_1, W_2, W_3 = least squares regression weights; X_2 = number of tasks performed; X_3 = number of tasks performed, squared; and K = regression constant. This equation produced a validity of .95 in predicting supervisory judgment concerning job difficulty level. Inclusion of the squared term was necessary because of a curvilinear relationship between the number of tasks in jobs and their perceived difficulty levels.

You might be interested in how we measured task difficulty level, which is included in the equation. Here we set up a criterion using a somewhat unique approach. First we asked a group of supervisors to rank all tasks in their ladder in terms of their difficulty level. As you might imagine, they didn't care much for this chore, since over 500 tasks were included in the package. However, they worked on the problem until they lost patience and turned in the results. We next reordered the sets in terms of mean ranks, and sent those sets to a new group of supervisors. This time the supervisors were told that tasks were in approximate order of difficulty, but that they were to make adjustments until the tasks were in exact order of difficulty. Again the tasks were reordered in terms of the adjusted mean ranks, and sent to a third group of supervisors. This process was continued through several iterations, until the inter-rater agreement concerning *adjustments* was driven to approximately zero. By this manner we created what might be considered as an ultimate criterion based on supervisory judgments.

Of course we could not afford to repeat this process in all ladders. Our goal was to find a similar approach which would produce the same results. To our surprise and pleasure, we found that simply averaging *ratings* of relative difficulty obtained using a seven-point scale produces essentially the same results, when such ratings are averaged across a sufficiently large number of supervisors. We now use this simpler approach.

Once we have obtained task difficulty ratings for a career ladder, we have a computer program which will apply our equation and rapidly compute the difficulty level of every job included in a survey. Several uses will be made of these job difficulty values. First, it is hypothesized that there is a tendency for supervisors to assign the more difficult jobs to the most capable individuals. If in fact this is the case, one should consider the difficulty level of the job being performed along with the level of performance in determining the productivity of any individual. Second, we would like to make a comparison of the difficulty level of work being assigned to New Standards Airmen as compared with the difficulty level of work being assigned to their contemporaries. I don't know how anyone can interpret the results of Project 100,000 unless there is evidence that New Standards Airmen are being assigned the same types of jobs as are being assigned their fellow workers. In a similar manner, we wish to compare the average difficulty of work being assigned to by-pass specialists, technical school graduates, and directed duty assignees.

Performance evaluation is another area which must draw the attention of those of us who conduct occupational research. And for awhile, I feel we should leave aside the almost impossible problem of evaluating individuals for upgrading and concentrate on the development of criteria for evaluating selection and classification devices, training programs, reassignment actions,

proficiency tests, and other force development mechanisms. Data collected for these purposes need not affect individuals or units, and can be brought out from under the normally-encountered emotionally charged atmosphere.

The more one thinks about it, the less meaningful performance evaluation at the job level becomes. It doesn't help trainers very much to discover that one group of individuals performs well on the job and another group of individuals performs poorly on the job. Under this circumstance, little information is provided concerning what changes should take place in training to help individuals who are performing poorly to improve their performance. Similarly, if one is comparing the efficiency of two training techniques, it would be extremely dangerous to do so by comparing the overall job performance of individuals receiving one training treatment as compared with the overall performance of individuals receiving the alternative training treatment. It could be that no differences are discovered, when in fact one training technique is significantly superior to the second in teaching individuals to perform one subset of tasks, while the second training technique is significantly superior to the first in training individuals to perform a second subset of tasks. Such differences could be masked if one were to deal with overall performance.

In the same manner, overall job performance criteria are of little benefit to developers of selection and classification devices. It is entirely possible that an individual may perform one subset of tasks well in his job and another subset of tasks poorly. It is also true that one subset of tasks may require a particular pattern of aptitudes, while another subset of tasks requires aptitudes which are almost unrelated.

If one is going to use performance evaluation information as a basis for determining careering and reassignment actions he needs to know how well an individual performs on each particular task that he is assigned to do. Overall performance evaluation has but little power for determining the relative merits of assigning a man to alternative vacancies.

As difficult as it may sound, I feel that until we learn more about performance and what contributes to it, we should consider every task being performed as a separate criterion. Before the advent of the electronic computer, such an undertaking would have been inconceivable. However now, with the computing capabilities already in being, dealing separately with five or six hundred criteria in a career ladder is completely within the realm of possibility. At some later stage we may wish to group tasks which are similar in terms of work requirement factors. But until we have studied tasks individually, I feel we shall not have sufficient information to deal with criterion measures at the global level.

Those of you here might be interested in knowing that OSD is sponsoring a task-oriented criterion research project in the Air Force. I hope that I will be able to report promising results next time we get together.

Now let me "go around the table" and make a few remarks to each participant and discussant. I feel I had better preface these remarks with the statement: "The following views are those of the writer and are not necessarily those of the United States Air Force."

First let me thank Commander Cormack and his Canadian friends. They were the first to accept the task survey approach and run with it. They took the best of what the Air Force had developed and adapted it to their own needs. I am particularly pleased with the amount of energy the Canadians spend in constructing an inventory instrument. They spend a lot of time in operational organizations observing and interviewing before sending an inventory to press. However, I am a little surprised that Commander Cormack failed to mention a "mail review." We have obtained good results through sending preliminary inventories by mail to supervisors throughout the world for their comments and recommended changes and additions. In this manner, we get inputs from all types of organizations which are functioning in all types of settings. I don't see how even in a relatively small military service one can afford to send inventory constructors to all such locations. Perhaps the answer lies in the write-ins obtained during the final survey. If the Canadians are obtaining a significant number, it would indicate to me that a mail review might improve their product.

It is indeed unfortunate that manpower and money cannot be made available in Canada for occupational research. Perhaps someone should review the manpower and personnel research which is currently being staffed and funded and weigh the probabilities of pay-offs against those which might result from occupational research.

To Mr. Meyer and the Army, I concurrently extend my sympathy and congratulations. Your service appears to have readily accepted the idea of setting up an occupational data bank, but it established what I would consider to be an impossible target date for completion. I am amazed that you have been able to accomplish as much as you have in such a restricted time period. You must have been forced to commit yourselves to some procedures without ample time for "pre-testing." There have been a number of times we have gone to the field with a procedure which looked good to us, but which produced completely unusable data.

You state that you are now planning a "major system change" in order to make your data bank more responsive. It may be that an approach which says "Conduct a series of fast iterations in which you open yourself to mistakes but take full advantage of your experience on the next go-round" yields the desired result earlier than an approach which says "Be sure you are right, then go ahead." In my view, the Army is fortunate to have an energetic and capable staff working on its' data bank, and I feel it is just a matter of time before all users will be solidly behind your product.

To Mr. Lewis and the Department of Labor, I offer my apologies. It was unfair of me to organze a symposium in which nine participants and discussants are approaching a subject area using one methodology, while the tenth is taking a different approach. Under this condition, the biases of the majority always prevail.

The Department of Labor has been in the occupational research business for decades. They have worked out techniques which have served their purposes well. They have fought the problems of gaining user support and won. The DOT is the "bible" for anyone desiring information about civilian jobs. I think we all can learn a lot from these endeavors. The military services seemed to be primarily dwelling on the problem of defining what incumbents do on the job. I believe we are making progress toward this goal. The Department of Labor, on the other hand, has spent a great deal of energy on occupational classification, definition of the dimensions of worker functions, establishment of job requirements, identification of tools and processes, enumeration of worker traits, establishment of physical demands, definition of environmental factors, and a host of other job-related factors. We in the military services need to take full advantage of these products.

At the same time, I would encourage the Department of Labor to investigate why all of the services seem to be so excited about the advantages of the job survey approach over the more traditional use of trained analysts.

Dr. Morsh is next on the list, and I guess to be fair I should say a few things to the Air Force. We have spent a great deal of time and money developing a methodology, but we have been slow in taking advantage of it. The techniques were ready for implementation in 1964; yet the Marine Corps, which made the decision for implementation only this year, will soon have a larger operational survey capability than the Air Force.

I haven't said much about HEW and Dr. Brumback. Yet Dr. Brumback is the only one among us who has had extensive experience in collecting inventory information from civilians. He surveyed nearly 6,000 professionals and technicians working for the Public Health Service, and seems to be enthusiastic with the results.

I appreciate the comments and questions in Dr. Brumback's discussant paper. Most of the papers have dealt with descriptions of programs and applications – and this is appropriate in light of the symposium title. However, one product of any symposium should be suggestions for research, and Dr. Brumback has contributed along this line.

How could anyone keep from admiring the Marine Corps? Once they decide to do something, they waste little time in getting it accomplished. They seem to be immune to the NIH (Not Invented Here) disease which plagues most of us. Instead, they evaluate what everyone else has done, take what they feel is best, and put it into motion. I firmly hope that the Marine Corps will back up Lt Colonel Van Cleve's last statement: "The Marine Corps will become a source of improvements to the state of the art, just as you gentlemen have been in the past." I feel that the problems are numerous enough to support a research staff in all services.

I have had several conferences with Joe Cowan, and I know he is anxious to see the Coast Guard undertake job surveys using the inventory approach. I fully understand and appreciate the problems of funding such an enterprise, even though evidence indicates a possible high yield of cost savings. Lt Colonel Van Cleve indicates that the Marine Corps is adopting the CODAP analysis system to their new computer. Perhaps, if the Coast Guard could see fit to construct one or more

experimental inventories and administer them to their personnel, arrangements could be made to have them analyzed on the Marine Corps' computer.

Unfortunately our only discussant from the university environment didn't make it to the symposium. I'm sure that most of you know that Dr. Ernest McCormick at Purdue University has conducted occupational research under contracts with several of the Services. He has played a significant role in the Air Force program for the past ten years.

Mac wrote me a letter about two months ago, saying that he was going to India to avoid having to prepare for this symposium. I replied that he couldn't get out of it that easily. You will find his comments in this published report.

I don't know what to say about Mr. Ramras. I can only testify that he is on the road a great part of the time, since this was the case every time I called his office. Eugene mailed his comments to us about two weeks before the publication deadline. Unfortunately they did not arrive, and he was out of town and could not be made aware of the problem.[1]

I do know that the Navy has an active interest in the occupational survey area. They have already collected and analyzed the results of several surveys. I also realize that the Navy has a difficult challenge to meet. In the Air Force, it is a relatively simple matter to construct a job inventory to cover all of the jobs performed by individuals in a career ladder. It can usually be accomplished with 300–500 task statements. In the Navy, on the other hand, individuals aboard ship may be assigned a large number of secondary jobs which, in total, may consume a very considerable portion of their work time. I'm not sure how the Navy is going to handle this problem.

I feel that those who are conducting occupational research in the Navy also have another serious problem in the form of a limitation of computer power. It is difficult to analyze thousands of jobs at the task level without a relatively large high-speed computer with adequate memory. I hope they will be able to overcome this handicap.

In closing, let me again thank all of the participants and discussants for their cooperation. I feel the symposium was a success, even before it began, because of your willingness to contribute to this report.

However, I suggest that we need to do more than to simply describe our programs and goals. We should arrange for other get-togethers where we can get down to specifics. In reading the several papers, it became apparent to me that much research is needed. Yet, the availability of research manpower and funds is so restricted, we cannot afford duplication of effort. I recognize that some of the services do not have an on-going research program at the present time. But you can make a contribution by sharing the problems you have encountered and indicating the questions you need to have answered. I propose that we all get together at least once a year for interchange of experiences, identification of research needs, and evaluation of progress. But let's not try to do it in fifty minutes.

[1] Fortunately, Mr. Ramras' comments arrived at the very last minute, and have been included in the report. They were "lost on base."

APPENDIX I. RELIABILITY OF JOB DESCRIPTIONS
Computed From Task Inventory Survey Data

Specialty	N	R_{11} % Perform	R_{11} Time Spent
Helicopter Mechanic			
43130	39	.965	.955
43150	256	.996	.986
43170	81	.961	.828
43190	26	.957	.965
Medical Administrative			
90630	76	.936	.894
90650	347	.985	.969
90670	189	.981	.951
90690	56	.968	.961
Management Engineering			
73331	42	.971	.958
73370	101	.984	.957
73371	180	.994	.973
73391	133	.952	.889
Outside Wire/Antenna			
36150	199	.987	.965
36170	92	.963	.919
36190	22	.958	.895
Electrical Power Production			
54330	70	.953	.952
54350	457	.987	.986
54370	143	.981	.970
Radiology			
90350	180	.997	.996
90370	78	.986	.975
Education and Training			
75132	146	.983	.972
75150	45	.974	.918
75170	30	.960	.935
75172	381	.995	.992
75190	28	.891	.895
Medical Material			
91530	63	.888	.813
91550	292	.978	.959
91570	137	.949	.908
91590	21	.931	.890
Preventive Medicine			
90750	113	.979	.955
90770	63	.966	.917
Jet Engine Mechanic			
43230	76	.979	.961
43250	473	.997	.992
43270	241	.985	.968
43290	35	.982	.974

Total (2 N) = 9822

APPENDIX II. Weather Technician

JOB DESCRIPTIONS FOR WEATHER SPECIALIST INVENTORY — AFHRL,PERS RSCH DIV-AFSC, LACKLAND AFB, TEX 78236

TASK JOB DESCRIPTION,CASES= 442,TASKS= 180,DUTIES= 8,MBRS= 347
OAFSC 25370 WEATHER TECHNICIAN

D-TSK		DUTY/TASK TITLE	CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	AVERAGE PERCENT TIME SPENT BY MEMBERS PERFORMING	PERCENT OF MEMBERS PERFORMING
D	2	ANSWER TELEPHONE INQUIRIES ABOUT THE WEATHER	96.54	1.78	1.72	1.72
D	14	MAINTAIN METEOROLOGICAL WATCH	92.22	1.58	1.46	3.18
D	10	INTEGRATE ANALYSIS, LATEST OBERVATIONS, AND FORECASTS	92.80	1.49	1.38	4.56
D	11	INTERPRET CENTRALLY PREPARED PRODUCTS FOR TERMINAL AAND ROUTE FORECASTS	90.78	1.41	1.28	5.84
D	41	PROVIDE ENROUTE DESTINATION AND ALTERNATE FORECASTS	88.18	1.43	1.26	7.11
D	19	PERFORM SHORT PERIOD FORECASTING OF FOG, STRATUS, AND VISIBILITY	91.64	1.37	1.25	8.36
D	20	PERFORM SHORT PERIOD FORECASTING OF SURFACE WINDS AND LOW LEVEL TURBULENCE	92.51	1.35	1.25	9.61
E	22	EVALUATE PILOT REPORTS	91.93	1.34	1.23	10.84
D	5	CONDUCT PILOT WEATHER BRIEFINGS	84.15	1.46	1.23	12.07
D	6	DISSEMINATE WEATHER WARNINGS	91.35	1.32	1.21	13.20
D	4	COMPLETE AND SIGN WEATHER CLEARANCE FORMS	84.15	1.44	1.21	14.49
E	24	IDENTIFY AND EVALUATE AREAS OF SEVERE WEATHER	90.78	1.31	1.19	15.68
D	18	PERFORM SHORT PERIOD FORECASTING OF CONDENSATION, PRECIPITATION, AND ICING	89.34	1.25	1.12	16.79
F	16	INDICATE POSITIONS OF FRONTS AND PRESSURE SYSTEMS ON CHARTS	91.07	1.20	1.10	17.89
F	21	PERFORM SURFACE CHART ANALYSIS	91.35	1.19	1.09	18.98
F	11	DETERMINE FRONTAL-ASSOCIATED WEATHER	88.76	1.21	1.07	20.06
D	36	PREPARE THUNDERSTORM AND HAIL WARNINGS	88.18	1.21	1.07	21.13
E	23	EVALUATE THE EFFECTS OF SURFACE CONVECTIVE HEATING	88.18	1.19	1.05	22.18
D	22	PREPARE AND PRESENT OPERATIONAL OR PLANNING WEATHER BRIEFINGS	77.52	1.34	1.04	23.22
D	34	PREPARE SURFACE WIND WARNINGS AND ADVISORIES	88.76	1.15	1.02	24.24
A	4	DETERMINE SOLUTIONS TO OPERATIONAL METEOROLOGICAL PROBLEMS	67.44	1.51	1.02	25.26
F	3	ANALYZE SOUNDING DATA ON THERMODYNAMIC DIAGRAMS	88.47	1.15	1.02	26.28
D	45	USE PROBABILITY TABLES IN FORECASTING	83.86	1.21	1.01	27.29
D	30	PREPARE MET WATCH ADVISORIES	84.44	1.20	1.01	28.30
D	44	USE OBJECTIVE FORECAST STUDIES IN PREPARING WEATHER FORECASTS	88.47	1.14	1.01	29.31
F	8	COMPUTE STABILITY INDICES	88.76	1.11	0.99	30.30
D	3	BRIEF AIRCRAFT ON FLIGHT	83.86	1.17	0.98	31.28
H	5	OPERATE REPRODUCTION EQUIPMENT	77.23	1.26	0.97	32.26
F	19	PERFORM FRONTAL ANALYSIS	87.61	1.10	0.96	33.22
F	18	INTEGRATE RADAR AND PILOT REPORTS ON SURFACE ANALYSIS	88.47	1.07	0.95	34.17
E	26	LOCATE AREAS OF MECHANICAL TURBULENCE	83.57	1.12	0.94	35.11

Appendix II. (*Continued*)

H	4	OPERATE PILOT-C-FORECASTER RADIO EQUIPMENT	76.37	1.22	0.93	36.04
F	22	RELATE FACTORS SUCH AS DEWPOINT OR WIND SHEAR TO POSITION OF SURFACE FRONTS	85.88	1.08	0.92	36.96
E	8	CORRELATE NEPH ANALYSES	82.13	1.11	0.91	37.87
F	12	DETERMINE INVERSION TYPES	85.30	1.06	0.90	38.78
A	2	COORDINATE METEOROLOGICAL ACTIVITIES WITH OTHER BASE AGENCIES	73.49	1.22	0.90	39.67
E	1	CHECK TERMINAL FORECAST AGAINST PROBABILITY TABLES	76.37	1.16	0.89	40.56
F	24	REFINE LOCAL CHARTS TO THE POINT OF REASONABLE AGREEMENT WITH CENTRALLY PRODUCED CHARTS	86.17	1.02	0.88	41.44
F	6	ANALYZE WINDS ALOFT CHARTS	80.98	1.09	0.88	42.32
D	24	PREPARE BRIEFING AIDS FOR OUT OF STATION BRIEFINGS	72.05	1.20	0.86	43.18
D	39	PREPARE WEATHER FLIMSIES FOR FLIGHT OPERATIONS	66.86	1.29	0.86	44.05
E	28	LOCATE JET STREAMS	82.13	1.05	0.86	44.91
E	20	EVALUATE METEOROLOGICAL EFFECTS DUE TO RISING OR SINKING AIR	81.84	1.04	0.85	45.76
D	9	IDENTIFY PILOT'S COURSE ON BRIEFING MAPS	76.95	1.10	0.85	46.61
F	25	SKETCH PROGNOSIS OF MAJOR FEATURES OF SURFACE AND UPPER AIR CHARTS	83.29	1.02	0.85	47.46
D	12	INTERPRET RADAR PRESENTATION OF METEOROLOGICAL PHENOMENA	73.20	1.15	0.84	48.30
F	20	PERFORM PRESSURE AND TEMPERATURE ANALYSIS	82.42	1.01	0.83	49.14
E	29	LOCATE SEMI-PERMANENT PRESSURE SYSTEMS	79.83	1.04	0.83	49.96
D	31	PREPARE PROGNOSIS OF SURFACE WEATHER SYSTEMS	77.81	1.06	0.82	50.79
D	40	PREPARE WEATHER PORTION OF FLIGHT FOLDERS	67.72	1.20	0.81	51.60
E	18	EVALUATE ACTUAL AND POTENTIAL AIR MASS STABILITY	79.25	1.02	0.81	52.41
D	13	ISSUE MET WATCH ADVISORIES TO AIRCRAFT	78.96	1.01	0.80	53.21
E	25	LOCATE AREAS OF CLEAR AIR TURBULENCE	78.67	1.01	0.79	54.00
E	37	USE PERSISTENCY TABLES IN PERFORMING METEOROLOGICAL FUNCTIONS	76.95	1.03	0.79	54.79
F	15	IDENTIFY MOISTURE SOURCE REGIONS	76.37	1.03	0.79	55.58
F	23	RELATE INTENSITY OF ADVECTION TO SUCH ELEMENTS AS WIND SPEED OR TEMPERATURE GRADIENTS	80.98	0.97	0.79	56.36
A	25	SUPERVISE WEATHER OBSERVERS (AFSC 25231, AFSC 25251)	68.01	1.12	0.76	57.13
F	17	INTEGRATE CHARTS FOR VERTICAL CONSISTENCY AND CONTINUITY	74.35	1.03	0.76	57.89
E	21	EVALUATE MOISTURE ELEMENTS SUCH AS VAPOR PRESSURE, MIXING RATIO AND RELATIVE HUMIDITY	78.96	0.95	0.75	58.65
E	11	DETERMINE AIR MASS MOISTURE CONTENT AND POTENTIAL MODIFICATION	74.64	1.00	0.74	59.39
D	33	PREPARE RAIN OR SNOW WARNINGS	79.25	0.94	0.74	60.13
E	31	LOCATE VORTICITY AREAS TO DETERMINE EFFECTS OF POSITIVE VORTICITY ADVECTION	74.06	1.00	0.74	60.87
E	27	LOCATE HEIGHT OF TROPOPAUSE	78.96	0.93	0.73	61.60
A	7	MAINTAIN QUALITY CONTROL PROGRAM	62.82	1.16	0.73	62.34
F	5	ANALYZE THERMODYNAMIC DIAGRAMS	70.89	1.02	0.73	63.06
A	8	MONITOR ANALYSIS OF METEOROLOGICAL CHARTS AND DIAGRAMS	63.98	1.11	0.71	63.77
E	16	DETERMINE WEATHER PHENOMENA ON THE BASIS OF VORTICITY CONCEPTS	74.93	0.94	0.71	64.48
F	10	DETERMINE ADVECTION TYPES AND EFFECT ON PRESSURE SYSTEMS	74.64	0.95	0.71	65.19

APPENDIX III. Disbursement Accounting Specialist

JOB DESCRIPTION FOR AMN IN ACCOUNTING/FINANCE CAREER LADDER-AFSCS 671XX

TASK JOB DESCRIPTION,CASES=1543,TASKS= 468,DUTIES= 14,MBRS= 532
OAFSC 67153 DISBURSEMENT ACCOUNTING SPECIALIST

D-TSK		DUTY/TASK TITLE	CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS.....	AVERAGE PERCENT TIME SPENT BY ALL MEMBERS.....	AVERAGE PERCENT TIME SPENT BY MEMBERS PERFORMING....	PERCENT OF MEMBERS PERFORMING.....
E	2	ANSWER INQUIRIES CONCERNING MILITARY PAY OR ALLOWANCES	51.32	7.08	3.63	3.63
E	35	PROVIDE COUNTER SERVICE FOR MILITARY PAY SECTION	37.59	7.39	2.78	6.41
E	10	COMPUTE CHANGES TO MPRS	33.08	6.84	2.26	8.67
J	10	COMPUTE TRAVEL ALLOWANCES	20.68	10.43	2.16	10.83
E	27	PREPARE CODING SHEETS OF CHANGES TO MPRS	25.94	7.63	1.98	12.81
E	1	ALIGN MILITARY PAY RECORDS (MPRS) FOR PAY COMPUTATION	34.02	5.71	1.94	14.75
J	20	MAINTAIN INDIVIDUAL TRAVEL RECORDS (AF FORM 1267)	20.68	9.02	1.87	16.61
E	8	CODE CHANGES TO MPRS	27.07	6.84	1.85	18.47
E	3	ASSEMBLE MPRS INTO BATCHES	30.64	5.93	1.82	20.28
E	22	MAKE MANUAL ENTRIES ON MPRS	29.70	5.63	1.67	21.96
J	12	DETERMINE VALIDITY OF TRAVEL ORDERS	21.05	7.39	1.55	23.51
E	33	PROCESS TRANSFER-IN MPRS	19.74	7.07	1.39	24.91
E	46	WRITE CORRESPONDENCE ABOUT MILITARY PAY MATTERS	28.01	4.91	1.38	26.28
J	19	MAINTAIN FILES OF TRAVEL DOCUMENTS AND RECORDS	18.80	7.16	1.35	27.63
J	39	REVIEW TRAVEL VOUCHERS	17.48	7.63	1.33	28.96
E	18	MAINTAIN FILES OF MILITARY PAY DOCUMENTS OR LOCATOR CARDS	19.17	6.79	1.30	30.26
E	28	PREPARE PAY ADJUSTMENT AUTHORIZATIONS	26.32	4.84	1.27	31.54
E	39	REVIEW OR EDIT MILITARY PAY ORDERS OR MPRS	23.87	5.28	1.26	32.80
J	6	COLLECT BASIC ALLOWANCE SUBSISTENCE (BAS) FROM MILITARY PERSONNEL	18.23	6.88	1.25	34.05
E	36	PUNCH PAPER TAPE FROM INPUT DATA FORMS	20.30	6.01	1.22	35.27
J	9	COMPUTE AND PROCESS VICINITY TRAVEL FORMS	16.92	7.06	1.19	36.47
F	19	OPERATE MILITARY PAY COMPUTER	19.55	6.03	1.18	37.64
E	34	PROCESS TRANSFER-OUT MPRS	17.29	6.69	1.16	38.80
J	21	MAINTAIN VOUCHER CONTROL LOG FOR DISBURSEMENT AND COLLECTION VOUCHERS PROCESSED IN TRAVEL AREA	14.85	7.70	1.14	39.95
J	14	EDIT TRAVEL DOCUMENTS	15.41	7.07	1.09	41.04
E	20	MAINTAIN MILITARY PAY DOCUMENT CONTROL LOGS	14.10	7.63	1.08	42.11
E	26	PREPARE CHARGE-OUT CARDS FOR MILITARY PAY SECTION	18.42	5.84	1.08	43.19
J	1	ADJUDICATE AND PROCESS COLLECTION VOUCHERS	18.42	5.52	1.02	44.20
E	5	AUDIT CHANGE DOCUMENTS AGAINST MPOS OR MPRS	18.80	5.25	0.99	45.19
E	41	SCREEN MPRS FOR PAY EXCEPTIONS BEFORE EOM PAY COMPUTATION	18.61	5.29	0.98	46.17
E	7	CLOSE OR OPEN MPRS MANUALLY	17.11	5.62	0.96	47.13
E	38	REVIEW MILITARY PAY DOCUMENTS FOR EDIT ERRORS OR REJECTIONS	18.61	4.98	0.93	48.06
E	6	AUDIT CODED CHANGES OR MANUAL ENTRIES ON MPRS	16.92	5.14	0.87	48.93
E	23	MATCH MILITARY PAY ORDERS AGAINST OTHER DOCUMENTS	15.41	5.55	0.86	49.79
E	17	KEY PUNCH MILITARY PAY PCAM CARDS	16.92	4.97	0.84	50.63

Appendix III. *(Continued)*

E	31	PROCESS SEPARATION OR DISCHARGE ACTIONS	13.35	6.11	0.82	51.46
J	15	ESTIMATE COSTS OF TRAVEL AND TRANSPORTATION	13.91	5.65	0.79	52.25
L	15	DISTRIBUTE MILITARY PAY ORDERS OR DOCUMENTS	13.16	5.61	0.74	52.97
F	27	RECONSTRUCT MPRS	15.23	4.75	0.72	53.69
E	13	COORDINATE PROCESSING OF MILITARY PAY DOCUMENTS WITH OTHER ACCOUNTING AND FINANCE SECTIONS	15.04	4.74	0.71	54.40
F	8	EDIT CHANGE TAPE INPUT FOR ERRORS	11.84	5.84	0.69	55.10
J	3	CITE FUNDS FOR TRAVEL AND TRANSPORTATION	12.03	5.65	0.68	55.78
E	29	PREPARE POSTING MEDIA FOR MILITARY PAY SECTION	12.78	5.26	0.67	56.45
J	13	DISTRIBUTE TRAVEL AND TRANSPORTATION DOCUMENTS	12.59	5.31	0.67	57.12
J	17	INTERPRET STATUTES OR DIRECTIVES FOR QUESTIONS OF ENTITLEMENT TO TRAVEL AND TRANSPORTATION FUNDS	11.09	5.94	0.66	57.78
S	4	ASSIGN CONTROL OR DOCUMENT NUMBERS TO MILITARY PAY ORDERS OR DOCUMENTS	12.39	5.16	0.65	58.43
D	8	GIVE INFORMAL TRAINING TO INDIVIDUALS	16.17	3.92	0.63	59.06
J	23	PREPARE CORRESPONDENCE ON TRAVEL CLAIMS	13.16	4.68	0.62	59.68
E	43	SORT MILITARY PAY CHANGE DOCUMENTS	12.59	4.79	0.60	60.28
F	3	CLOSE OR OPEN MPRS BY COMPUTER	11.65	5.08	0.59	60.87
J	16	FOLLOW-UP UNLIQUIDATED TRAVEL AND TRANSPORTATION OBLIGATIONS	12.22	4.81	0.59	61.46
J	32	PREPARE POSTING DATA TRANSFERS (PDTS) FOR TRAVEL	8.27	6.63	0.55	62.01
F	28	REVIEW MILITARY PAY PRINTOUTS	12.97	4.09	0.53	62.54
E	45	VERIFY MILITARY PAY PCAM CARDS	10.53	4.98	0.52	63.06
A	12	INTERPRET ACCOUNTING AND FINANCE PROCEDURES TO SUBORDINATES	13.53	3.81	0.52	63.58
E	19	MAINTAIN FILES OF MILITARY PAY PCAM CARDS	9.77	5.24	0.51	64.09
E	21	MAINTAIN MILITARY PAY MANUALS	13.72	3.71	0.51	64.60
E	32	PROCESS SUBMISSION OF MPRS TO AFAFC	12.03	4.20	0.51	65.11
J	18	KEY PUNCH TRAVEL DOCUMENTS	6.95	6.98	0.49	65.59
J	34	PROCESS DOCUMENTS RECEIVED ON REGISTER OF TRANSACTIONS BY OTHERS	7.89	6.12	0.48	66.07
F	21	PREPARE MILITARY PAY REPORTS SUCH AS ALLOTMENT RECONCILIATION, ACCRUED MILITARY PAY, OR FICA	11.05	4.33	0.48	66.56
E	9	COLLECT MILITARY PAY DATA FOR THE REPORT OF ACCOUNTING AND FINANCE ACTIVITIES	10.71	4.27	0.46	67.01
H	43	PREPARE U. S. TREASURY CHECKS	6.39	6.71	0.43	67.44
F	17	MAINTAIN OR VERIFY BATCH CONTROL LOGS AND FILES	9.40	4.34	0.43	67.87
B	3	SUPERVISE APPRENTICE DISBURSEMENT ACCOUNTING SPECIALISTS (AFSC 67133)	10.34	4.05	0.42	68.29
F	22	PREPARE OR VERIFY DAILY TRIAL BALANCE OF COMPUTER TRANSACTIONS	9.21	4.53	0.42	68.70
F	24	PROCESS ALLOTMENT PCAM CARDS TO MPRS AND PREPARE SUBMISSION FOR AUTOMATIC DIGITAL NETWORK (DATE) SYSTEM	7.33	5.62	0.41	69.12
E	16	GATHER MILITARY PAY DOCUMENTS OR PAPERS FOR AUDIT	9.21	4.44	0.41	69.53
E	30	PROCESS DEATH GRATUITY AND ARREARS OF PAYMENT ACTIONS	9.40	4.30	0.40	69.93
J	11	DETERMINE TRAVEL FUND AVAILABILITY	9.59	4.21	0.40	70.33
F	31	VERIFY ENTRY OF POST PAYMENTS-FOR-SELF	10.34	3.90	0.40	70.74
C	4	DETERMINE PROPRIETY OF CLAIMS	4.89	8.22	0.40	71.14
E	44	USE DOCUMENT CONTROL LOGS TO MONITOR WORKFLOW OF MILITARY PAY SECTION	6.39	6.12	0.39	71.53
C	12	REVIEW FLOW OF DOCUMENTS BETWEEN AREAS	6.95	5.50	0.38	71.91
H	32	PREPARE MILITARY OR CIVILIAN PAY CHECKS FOR ISSUE OR MAIL	6.20	6.14	0.38	72.29

Appendix III. *(Continued)*

E	42	SKELETONIZE BATCH CONTROL AND OUTPUT TOTALS (AF FORM 1935)	8.65	4.29	0.38	72.67
D	3	CONDUCT ON-THE-JOB TRAINING	11.28	3.31	0.37	73.05
E	37	RECONCILE FICA OR ALLOTMENT DISCREPANCIES	10.71	3.48	0.37	73.42
A	9	ESTABLISH JOB PRIORITIES	11.84	3.08	0.36	73.78
J	4	CLASSIFY TRAVEL AND TRANSPORTATION TRANSACTIONS	8.46	4.28	0.36	74.15
H	40	PREPARE SUMMARIES SUCH AS THE DAILY SUMMARY OF CASH COLLECTIONS OR CASHIER'S DAILY SUMMARY	5.08	7.08	0.36	74.50
F	7	CONVERT MANUAL MPRS INTO MECHANIZED MPRS	8.65	4.13	0.36	74.86
J	25	PREPARE REQUESTS FOR OFFICIAL DISTANCES	9.96	3.45	0.34	75.21
F	11	MAINTAIN HISTORY FILES OF PUNCH PAPER TAPE (INPUT AND OUTPUT)	8.08	4.11	0.33	75.54
H	44	PROCESS VOUCHERS RECEIVED FROM SMAS	5.83	5.58	0.33	75.86
F	23	PREPARE SUPPLEMENTAL ACCRUAL ADJUSTMENTS	8.65	3.75	0.32	76.19
A	3	COORDINATE WITH BASE DATA SYSTEMS FOR PREPARATION OF MACHINE LISTINGS	9.02	3.48	0.31	76.50
H	45	PROOFREAD, STUFF, AND MAIL BUSINESS CHECKS	4.89	6.39	0.31	76.81
H	7	COUNT OUT CASH FOR PAYMENTS	5.64	5.35	0.30	77.12
A	23	PLAN WORKLOADS OR WORK ASSIGNMENTS	9.40	3.19	0.30	77.42
J	7	COLLECT TRAVEL DATA FOR ACCOUNTS CONTROL	7.52	3.84	0.29	77.70
F	1	BALANCE DAILY OR EOM CUMULATIVE PAYMENTS AND COLLECTIONS FOR MILITARY PAY SECTION	6.95	4.13	0.29	77.99
J	2	CERTIFY FUNDS FOR TRAVEL AND TRANSPORTATION	7.89	3.63	0.29	78.28
F	18	MONITOR PROGRAMS FOR ERRORS	7.71	3.71	0.29	78.56
H	13	IDENTIFY PAYEES	6.02	4.73	0.28	78.85
H	29	PERFORM CASH AND CHECK ACCOUNTABILITY FUNCTIONS	5.26	5.35	0.28	79.13
F	20	PREPARE EOM VOUCHER OR REPORT DATA FOR MILITARY PAY	6.08	4.20	0.28	79.41
A	5	COORDINATE WITH BASE TENANTS ON PROCEDURES OR PROBLEMS	8.27	3.33	0.28	79.68
E	14	DELIVER MILITARY PAY PCAM CARDS TO KEY PUNCH	6.77	4.00	0.27	79.95
A	11	ESTABLISH WORK STANDARDS, WORK CONTROLS, OR OFFICE PROCEDURES	9.40	2.87	0.27	80.22
D	9	INDOCTRINATE NEWLY ASSIGNED PERSONNEL	9.21	2.93	0.27	80.49
J	22	POST TRAVEL AND TRANSPORTATION DISBURSEMENTS AND COLLECTIONS TO FUND LEDGERS	5.08	5.16	0.26	80.75
F	15	MAINTAIN MILITARY PAY COMPUTER UNIT CONTROL REGISTER	5.83	4.49	0.26	81.01
F	13	MAINTAIN MAGNETIC STRIPS OR TAPES, TAPE CONTROL LOG, OR TAPE FILES	6.95	3.70	0.26	81.27
E	11	CONTROL AND POST CASH COLLECTIONS FOR SOLDIERS' DEPOSITS	6.20	4.12	0.26	81.53
A	20	PLAN METHODS FOR ORGANIZING AND FILING RECORDS	8.83	2.87	0.25	81.78
H	21	MAINTAIN CUSTODY OF CURRENCIES, CHECKS, OR OTHER NEGOTIABLE INSTRUMENTS	4.32	5.86	0.25	82.03
E	24	MONITOR CLAIMS SUBMITTED FOR CANCELLATION OR REMISSION OF INDEBTEDNESS	7.14	3.52	0.25	82.29
J	24	PREPARE MISCELLANEOUS OBLIGATION DOCUMENTS (MODS) FOR TRAVEL	6.20	4.02	0.25	82.54
J	28	PREPARE TRAVEL AND TRANSPORTATION COMMITTMENT DOCUMENTS	5.45	4.55	0.25	82.78
J	33	PROCESS CONTRACTUAL SERVICES VOUCHERS FOR TRAVEL	3.38	7.30	0.25	83.03
F	14	MAINTAIN MAGNETIC STRIP PRINTOUT FILE (AF FORM 1933)	6.77	3.61	0.24	83.28
H	47	REVIEW DISBURSEMENT, COLLECTION, OR ADJUSTMENT VOUCHERS	4.06	5.33	0.24	83.52
E	40	REVIEW TALLY TAPES FOR MILITARY PAY SECTION	6.58	3.59	0.24	83.75

Appendix III. *(Continued)*

H	37	PREPARE STATEMENT OF ACCOUNTABILITY	4.51	5.17	0.23	83.99
H	3	AUDIT U. S. TREASURY CHECKS AGAINST VOUCHERS	4.89	4.77	0.23	84.22
B	9	SUPERVISE DISBURSEMENT ACCOUNTING SPECIALISTS (AFSC 67193)	5.83	3.84	0.22	84.44
A	8	ESTABLISH INTRAOFFICE OR INTEROFFICE CUTOFFS	8.65	2.56	0.22	84.46
H	9	DETERMINE VALIDITY OF DOCUMENTS GIVING BASIS FOR CASH OR CHECK TRANSACTIONS	5.08	4.36	0.22	84.88
A	19	PLAN LOCAL OFFICE ORGANIZATION AND FILING	7.14	3.05	0.22	85.10
F	26	RECONCILE MPRS TO MPR CONTROL TOTAL	5.83	3.73	0.22	85.32
H	12	EXCHANGE FOREIGN CURRENCY	2.63	8.15	0.21	85.53
F	10	MAINTAIN ACCRUAL CONTROL OF MILITARY PAY ACCRUAL LEDGERS	4.89	4.36	0.21	85.75
C	13	TAKE CORRECTIVE ACTIONS FROM ERROR LISTINGS RECEIVED FROM HIGHER HEADQUARTERS	7.52	2.83	0.21	85.96
C	10	PREPARE AIRMAN PERFORMANCE REPORTS (APRS)	6.39	3.31	0.21	86.17
F	4	COLLECT MILITARY PAY ACCOUNTING DATA FOR ACCOUNTS CONTROL	5.26	4.01	0.21	86.38
H	14	INFORM OWNERS OF LOST BONDS OR CHECKS AS TO REPLACEMENT PROCEDURES	5.64	3.71	0.21	86.59
J	37	RECONCILE UNLIQUIDATED OBLIGATIONS OR ACCOUNTS PAYABLE WITH FUND LEDGER FOR TRAVEL	5.08	4.09	0.21	86.80
J	35	PROCESS FUNDING OF GOVERNMENT BILLS OF LADING	4.32	4.61	0.20	87.00
H	4	BALANCE MILITARY PAYROLLS WITH CHECK LISTINGS AND COMPUTER OUTPUT	4.89	4.01	0.20	87.19
F	9	INPUT MILITARY PAY VOUCHERS INTO THE MAFR SYSTEM	4.51	4.30	0.19	87.39
H	33	PREPARE MONEY LIST FOR CASH PAYMENTS	3.95	4.84	0.19	87.58
H	5	CANCEL INAPPROPRIATE CHECKS	6.02	3.15	0.19	87.77
H	2	AUDIT CASH PAYMENTS	4.51	4.16	0.19	87.96
J	38	REVIEW DAILY REGISTER OF MEAL TICKET AND TRANSPORTATION TRANSACTIONS	4.51	4.13	0.19	88.14
D	10	MAINTAIN OUT RECORDS	6.58	2.81	0.18	88.33
F	20	VERIFY PROCESSING OR CLASSIFICATION OF MPRS	5.08	3.64	0.18	88.51
B	6	SUPERVISE CIVILIAN EMPLOYEES	4.14	4.41	0.18	88.70
J	8	COLLECT TRAVEL DATA FOR REPORT OF ACCOUNTING AND FINANCE ACTIVITIES (RCS - AFC-92)	5.64	3.21	0.18	88.88
F	2	BALANCE TOTALS OF EOM ALLOTMENT RECONCILIATION REPORTS FOR MILITARY PAY	5.25	3.43	0.18	89.06
H	42	PREPARE TREASURY LIST AND MONTHLY REPORT ON TREASURY CHECKS	3.76	4.79	0.18	89.24
F	25	PUNCH PCAM CARDS FOR ALLOTMENT SUBMISSION GEOGRAPHICALLY SEPARATED UNITS (DATE)	3.76	4.71	0.18	89.41
C	25	MONITOR RECONCILIATION OF PAYMENTS IN MILITARY PAY AREA	4.14	4.26	0.18	89.59
J	31	PREPARE TRAVEL JOURNAL VOUCHERS FOR GENERAL LEDGER ACCOUNTING	5.64	3.12	0.18	89.77
H	34	PREPARE MONTHLY PAYROLL	3.95	4.34	0.17	89.94
H	41	PREPARE TRANSMITTAL DOCUMENTS	4.51	3.79	0.17	90.11
H	39	PREPARE SUPPORTING SCHEDULES TO THE STATEMENT OF ACCOUNTABILITY	3.38	5.05	0.17	90.28
H	15	INITIATE SUBSTITUTE OR STOP PAYMENT REQUESTS	5.08	3.36	0.17	90.45
H	36	PREPARE SAVINGS BONDS OR SAVINGS BONDS ISSUANCE SCHEDULES	3.76	4.48	0.17	90.62
F	5	COLLECT MILITARY PAY COMPUTER UNIT DATA FOR THE REPORT OF ACCOUNTING AND FINANCE ACTIVITIES (C-92)	4.70	3.51	0.16	90.78