

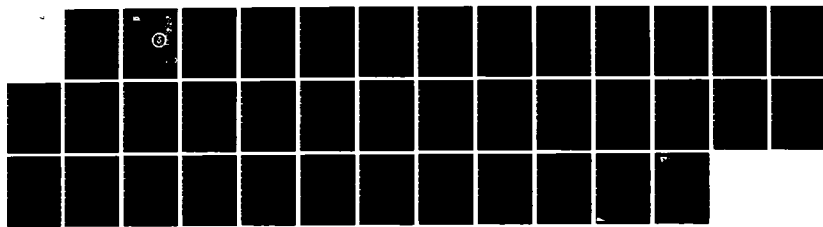
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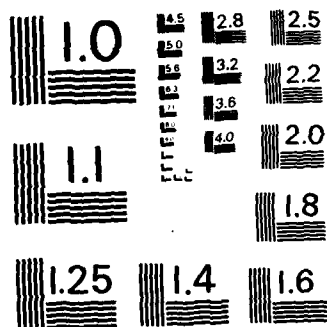
CARTOGRAPHY/GEODESY UTILIZATION FIELD AND GEODETIC  
CAREER FIELD (AFSS 57XX AND 222X0)(U) AIR FORCE  
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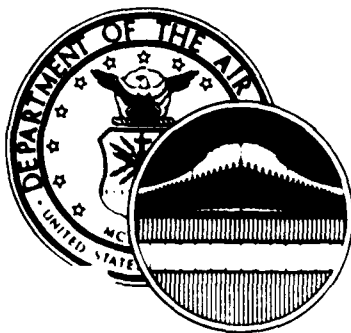
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UNITED STATES AIR FORCE

AD A139443

# OCCUPATIONAL SURVEY REPORT



CARTOGRAPHY/GEODESY UTILIZATION FIELD  
AND GEODETIC CAREER FIELD  
(AFSS 57XX AND 222X0)

AFPT 90-57X-469

JANUARY 1984

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OCCUPATIONAL ANALYSIS PROGRAM  
USAF OCCUPATIONAL MEASUREMENT CENTER  
AIR TRAINING COMMAND  
RANDOLPH AFB, TEXAS 78150

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## PREFACE

This report presents the results of a detailed Air Force Occupational Survey of the Cartographic and Geodetic Officer Utilization Field (AFS 57XX) and the enlisted Geodetic Surveyor Career Ladder (AFS 222X0). The project was requested by HQ AFIS/INE and was directed by USAF Program Technical Training, Volume Two, dated June 1983. Authority for conducting occupational surveys is contained in AFR 35-2. Computer printouts from which this report was produced are available for use by operating and training officials.

The survey instrument was developed by Mr J. S. Tartell, Occupational Survey Analyst, who also analyzed the data and wrote the final report, assisted by Ms O. Velez, who provided data automation support. This report has been reviewed and approved.

Copies of this report have been distributed to Air Staff sections, major commands, and other interested training and management personnel. Additional copies are available upon request to the USAF Occupational Measurement Center, Attention: Chief, Occupational Analysis Branch (OMY), Randolph AFB, Texas 78150.

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## SUMMARY OF RESULTS

1. Survey Coverage: Data were collected from 64 Cartographic and Geodetic Officers, representing 91 percent of the assigned strength, and 87 Geodetic Specialists, representing 85 percent of their assigned strength.
2. Job Structure: Analysis of the job structure of the AFS 57XX and AFSC 222X0 fields identified seven job groups. The jobs were categorized into plans and requirements, contract monitoring, management, training, surveying, and data preparation. The officer jobs reflect substantial variety, while the majority of enlisted personnel performed as geodetic surveyors.
3. Classification Descriptions: A comparison of tasks performed with the AFR 36-1 (for officers) and AFR 39-1 (for enlisted personnel) Specialty Descriptions revealed reasonably accurate summaries of the jobs actually performed.
4. Training Assessment: Comparison of job and task data with plans of instruction indicated substantial portions of the officer course in need of considerable review, while the enlisted course generally appeared appropriate for the jobs graduates performed.
5. Implications: Management intervention, in terms of additional authorizations, AF assignments, and additional education, appears necessary to build a utilization field sustaining force for the Cartographic and Geodetic Officers. Additionally, management should explore alternatives to the personal hardship resulting from extensive TDY requirements for many MC&G officer and, particularly, enlisted personnel.

OCCUPATIONAL SURVEY REPORT  
CARTOGRAPHY/GEODESY UTILIZATION FIELD  
AND GEODETIC CAREER FIELD  
(AFSS 57XX AND 222X0)

INTRODUCTION

The Cartographic and Geodetic fields consist of two officer specialties: Cartographic/Geodetic Officer, DAFSC 573X, and the Cartographic/Geodetic Staff Officer, DAFSC 571X. Enlisted AFSCs include the Geodetic Specialist, DAFSCs 22230, 22250, 22270, 22290, and 22200. The occupational survey data were collected and analyzed to identify current job structure and responsibilities, to document career field management needs, and to determine continuing training needs.

History

The Cartography/Geodesy utilization field has experienced a relatively stable history. The staff officer specialty evolved from the Photographic and Cartographic Staff Officer in 1954, to the Cartographic Staff Officer in 1960, to the present title in 1969. The Cartographic/Geodetic Officer specialty evolved from two separate specialties. The Cartographic Officer specialty was created in 1954 as AFS 2324 and the Geodetic Officer specialty was created in 1958 as AFS 2358. In 1960, the specialty codes were changed to AFS 5724 for the Cartographic Officer and AFS 5754 for the Geodetic Officer. In 1976, the specialties were combined into the present form as AFS 5734.

The present form of the enlisted Geodetic Career Field evolved from three specialties: the Surveyor specialty, AFSC 222X0 created in 1951; the Photomapping specialty, AFSC 220X0 created in 1954; and the Geodetic Computations specialty, AFSC 222X1 created in 1969. The present ladder, AFSC 222X0, was initiated in 1976 as the Geodetic Surveyor specialty and the title changed to the present form, Geodetic specialty, in 1977.

For the mapping, charting, and geodesy (MC&G) fields, there are two resident technical training courses. Listed below are the course titles, location, and length for these courses:

Mapping, Charting, and Geodesy Officer Course (MC&GOC)	Ft Belvoir	454.5 hours
Basic Geodetic Survey Course	Ft Belvoir	689.0 hours

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## SURVEY METHODOLOGY

### Inventory Development

The survey instrument used to collect data for this occupational survey was USAF Job Inventory AFPT 90-57X-469, dated April 1983. The task list was developed and validated during the period June 1982 through December 1982.

To construct the task list, interviews were conducted with 40 officers and 29 enlisted personnel assigned to 13 locations. Following an in-depth review by nine subject-matter experts, the job inventory was published in April 1983, containing 159 background items and 687 task statements.

### Survey Administration

From May through August 1983, Cartographic and Geodetic personnel with duty AFSCs of 5711, 5716, 5731, 5734, 22230, 22250, 22270, 22290, and 22200 were asked to complete a job inventory. Individuals filled out an identification and background information section and then indicated the tasks performed in their jobs. After selecting all tasks performed, respondents rated each task on the relative time spent scale shown below:

#### TIME SPENT PRESENT JOB

1. Very small amount.
2. Much below avg.
3. Below avg.
4. Slightly below avg.
5. About avg.
6. Slightly above avg.
7. Above avg.
8. Much above avg.
9. Very large amount.

### Data Analysis

As a first step in the analysis of occupational survey data, each respondent's time spent ratings were converted to relative percent of time spent data. To obtain time spent figures, all of an incumbent's relative time spent ratings were summed with the total representing all the person's total time on the job. Each task rating was then divided by the total and the quotient multiplied by 100 to provide the percent of time spent rating for each task.

For the purpose of organizing individual's responses into similar units of work, an automated clustering program was used. This hierarchical program is a basic part of the Comprehensive Occupational Data Analysis Program (CODAP) package for occupational analysis. Each survey respondent's job

description was compared to every other job description in terms of the relative amount of time spent on each task in the inventory. The clustering program is designed to locate the two job descriptions with the most similar tasks performed and percent time ratings and combine them to form a group with a composite job description. In successive stages, other survey respondents were added to the initial job group or new groups were formed based on the similarity of tasks performed and time spent. This procedure was continued until all individuals and groups were combined to form a single composite job description representing the total sample. Analysis of the resulting groups of jobs allowed identification of: (a) the number and characteristics of the different jobs which existed across the Cartographic and Geodetic specialties; (b) the tasks which tended to be performed together by the same respondents; and (c) task and incumbent characteristics which may be peculiar to specific functional requirements as they existed at the time of the survey.

### Sample

Personnel included in this survey were selected from the February 1983 Uniform Officer Record and Uniform Airman Record files. To be included, an individual had to possess the appropriate duty AFSC, been assigned to their duty position for at least 60 days, and not programmed for PCS, retirement or separation for 90 days. There were 66 officers and 96 enlisted personnel who met these criteria for inclusion in the survey sample. Completed job inventories were received from 64 officers and 87 enlisted personnel. These figures represent a 97 percent return rate for officers and a 81 percent return rate for enlisted personnel.

Tables 1 through 4 compare the grade and assignment characteristics of the survey samples with the population characteristics of the officer and enlisted fields. In all instances, survey samples are representative of the populations.

TABLE 1  
OFFICER GRADE DISTRIBUTION

<u>OFFICER GRADE</u>	<u>PERCENT OF</u>	
	<u>ASSIGNED</u>	<u>SAMPLE</u>
LIEUTENANT	40	39
CAPTAIN	22	24
MAJOR	15	17
LIEUTENANT COLONEL	19	17
COLONEL	4	3

TABLE 2  
ENLISTED GRADE DISTRIBUTION

<u>ENLISTED GRADE</u>	<u>PERCENT OF</u>	
	<u>ASSIGNED</u>	<u>SAMPLE</u>
E1-E3	6	6
E4	23	16
E5	38	43
E6	16	14
E7	10	15
E8-E9	7	6

TABLE 3  
OFFICER ASSIGNMENT DISTRIBUTION

<u>OFFICER MAJCOM</u>	<u>PERCENT OF</u>	
	<u>ASSIGNED</u>	<u>SAMPLE</u>
DEFENSE MAPPING AGENCY (DMA)	63	63
SAC	10	11
AFSC	12	9
TAC	1	2
MAC	1	2
EUCOM	1	2
OTHER	12	11

TABLE 4  
ENLISTED ASSIGNMENT DISTRIBUTION

<u>ENLISTED MAJCOM</u>	<u>PERCENT OF</u>	
	<u>ASSIGNED</u>	<u>SAMPLE</u>
DMA	73	69
SAC	9	13
AFCC	5	8
USAFE	7	7
AFSC	1	1
TAC	1	1
OTHER	14	1

## JOB STRUCTURE ANALYSIS

For the Cartographic and Geodetic survey, 151 individual job descriptions were compared to determine the job structure. The analysis identified seven groups of survey respondents. Table 5 lists the job groups and the percentage of the sample in each. Two impressions may be gathered from the information in Table 5. First is the small amount of overlap between the jobs performed by officers and those performed by enlisted personnel. Second is the similarity among the jobs identified in the structure analysis. More will be said about both of these impressions as further information is presented about each job identified in the structure analysis.

### Job Group Descriptions

This section of the analytical narrative provides details about each of the jobs identified by the job structure analysis. Information will be limited to a brief description of the respondents who comprise the job group and tasks which illustrate the nature of the job. The order in which the jobs will be presented is a result of the hierarchical clustering program. The only factor driving the ordering is that job inventory 0001, the lowest number, happened to be completed by a survey respondent performing a job merged into the Plans & Requirements Officer group. Figure 1 presents the results of the hierarchical clustering.

PLANS AND REQUIREMENTS OFFICERS (GPO017, N=20). Members of the Plans and Requirements Officers job group represented 13 percent of the total sample and 31 percent of the officer sample. These respondents performed an average of 114 tasks and were assigned to a variety of major commands and organizations. The grade range was from lieutenant through lieutenant colonel, with 80 percent being captain or higher. Virtually all of these officers reported positively on the indicators of job satisfaction.

Individuals in this group expended a substantial portion of their job time performing Staff (26 percent) and Command Management (16 percent) tasks. Tasks listed below illustrate the job performed by the Plans & Requirements Officers:

- Validate command MP&G requirements
- Forward command requirements to HQ USAF, AFIS, or DMA
- Coordinate command requirements for special MC&G support with DMA or AFIS/INTB personnel
- Prioritize MC&G taskings or work requests
- Monitor command requirements for MC&G support, such as data cases, film strips, or surveys

CONTRACT MONITORS (GPO024, N=6). This small group represented 4 percent of the overall survey sample and 9 percent of the officer sample. Individuals performed an average of 78 tasks, were assigned to AFSC or DMA, and were in the grades lieutenant through major.

Officers in the Contract Monitors job group spent substantial percentages of their job time performing tasks related to Contract Management and Staff functions, 36 percent and 11 percent, respectively. Tasks listed below are representative of the jobs performed:

- Consult with using command or SPO personnel on cartographic or geodetic requirements for weapons systems support
- Coordinate between contractors and DMA components on MC&G requirements
- Evaluate contractor compliance with test procedures or test plans
- Evaluate contractor's performance
- Participate in contractor meeting, such as preliminary or critical design reviews or technical interchange meetings

MANAGERS AND SUPERVISORS (GPO014, N=26). Incumbents in this job group represented 17 percent of the survey sample, 31 percent of the officer respondents and 7 percent of the enlisted respondents. Individuals reported performing an average of 100 tasks and were assigned primarily to DMA (69 percent) or SAC (23 percent). Officer incumbents included all grades, while the enlisted respondents were in grades E-6 through E-8. Slightly more than 60 percent reported supervising others; the average number supervised was nine. Personnel in this group reported the highest average length of service, slightly more than 15 years, making them among the most experienced respondents in the survey. These individuals reported a high level of job satisfaction.

Tasks from the Command and Management and Personnel and Resource Management duties accounted for the greatest proportion of these respondents job time (53 percent). The tasks listed below serve as examples of the jobs performed:

- Analyze workload requirements
- Counsel personnel on personal or military-related matters
- Interpret policies, directives, or procedures for subordinates
- Evaluate individuals for compliance with job performance standards
- Interview incoming or departing personnel

TRAINERS (GPO020, N=5). The Training job group represents 3 percent of the survey sample and includes 1 percent of the officer respondents and 6 percent of the enlisted respondents. These personnel reported performing an average of 33 tasks and all were assigned to DMS at Ft Belvoir VA as instructors.

Members of the Trainer job group spent more than one-half of their job time performing tasks from the Training duty. Tasks listed below illustrate the job performed:

Conduct formal or resident course classroom training  
Review lesson plans  
Counsel students on education or training progress  
Administer or score tests  
Write lesson plans

SURVEY TEAM CHIEFS AND NCOICs (GPO059, N=19). Members of this job group accounted for 13 percent of the total survey sample, 5 percent of the officer sample, and 18 percent of the enlisted sample. These respondents performed an average of 145 tasks, the largest average among all of the jobs. Incumbents were assigned to DMA units (63 percent), SAC (21 percent), or AFCC (11 percent). Personnel in this job group reported the greatest amount of experience in the MC&G fields, an average of more than 13 years each. The enlisted members of the group were primarily in grades E-6 through E-9 with the officers being two lieutenants and one major.

The members of the Team Chief & NCOICs job group spent most of their job time performing tasks from the duties related to Performing Surveys (41 percent) and Command and Management (16 percent). The tasks listed below reflect the jobs performed:

Perform presurvey reconnaissance  
Plan survey schemes  
Perform basic ground research for surveys  
Establish daily survey operations plans or outlines  
Write APRs

SURVEYORS (GPO033, N=48). The Surveyor job group encompassed 32 percent of the survey sample and includes 6 percent of the officer respondents and 51 percent of the enlisted respondents. These personnel performed an average of 48 tasks and were assigned to DMA units (67 percent), SAC (12 percent), or AFCC (10 percent). Incumbents reported high levels of job satisfaction. The officers in this job group were lieutenants who reported job titles as Team Chiefs but where task performance data placed them in the Surveyor job group. The enlisted incumbents' grade ranged from E-2 through E-7 with 54 percent reporting a grade of E-5.

The tasks performed by the respondents in the Surveyor job group may be viewed as the core job for enlisted MC&G personnel. Tasks from the Survey duty accounted for 64 percent of these respondents job time. Listed below are tasks which illustrate the job performed:

Pack or unpack survey equipment  
Make observations using conventional survey equipment  
Record conventional survey data  
Draw survey station sketches  
Write survey station descriptions

Within the Surveyor job group were a number of subsets which relate to slightly different types of surveys or use of different survey techniques, e.g., astronomic or doppler surveys, radar profiles or engineering support. Personnel in the Surveyor job group spend a substantial portion of their time TDY, with an average of 132 days in the year preceeding administration of the job inventory. In response to a question regarding the number of hours worked each day while TDY, 96 percent of the Surveyors reported working a greater number of hours per day while TDY than in a normal on-base job. For the Survey Team Chiefs and NCOICs (the previously discussed job group, GRP059), the average number of days TDY was 138 and 100 percent reported working longer hours when TDY. Despite these seeming irrantants, personnel in both job groups reported high levels of job satisfaction and positive career intentions.

Finally, given that this is the core job for personnel who complete the BGS course, Table 9 reflects the equipment used by Surveyor respondents.

DATA PREPARATION SPECIALISTS (GPO009, N=11). This group of respondents represented 7 percent of the survey sample, 5 percent of the officer respondents, and 9 percent of the enlisted respondents. All incumbents were assigned to DMA units (91 percent to GSS) and reported performing an average of 26 tasks, the smallest for any job group. Personnel in this group also reported the smallest amount of time in their current job, an average of 10 months, but reported time-in-service and time-in-career field averages similar to respondents in the Surveyor (GRP033) job group. Additionally, Data Preparation Specialists reported the lowest job satisfaction of members of any job group.

Tasks from the duties of Data Analysis and Survey Project Planning accounted for 67 percent of the job time for these personnel. Tasks listed below serve as examples of the jobs performed:

- Key in data using data entry terminal
- Extract data from computer products
- Review computer output for errors
- Correct data errors
- Compile or copy maps for field teams



TABLE 5  
JOBS IDENTIFIED BY STRUCTURE ANALYSIS

JOB GROUP	PERCENT MEMBERS PERFORMING		
	TOTAL SAMPLE*	OFFICERS	ENLISTED
PLANS & REQUIREMENTS OFFICERS (N=20)	13	100	-
CONTRACT MONITORS (N=6)	4	100	-
MANAGERS & SUPERVISORS (N=26)	17	77	23
TRAINERS (N=5)	3	20	80
SURVEY TEAM CHIEFS OR NCOICs (N=19)	13	16	84
SURVEYORS (N=48)	32	6	94
DATA PREPARATION SPECIALISTS (N=11)	7	27	73

\* PERCENTAGE OF RESPONDENTS PERFORMING JOBS IN EACH JOB GROUP  
REGARDLESS OF THEIR DUTY TITLES

FIGURE 1  
SIMPLIFIED JOB STRUCTURE DIAGRAM

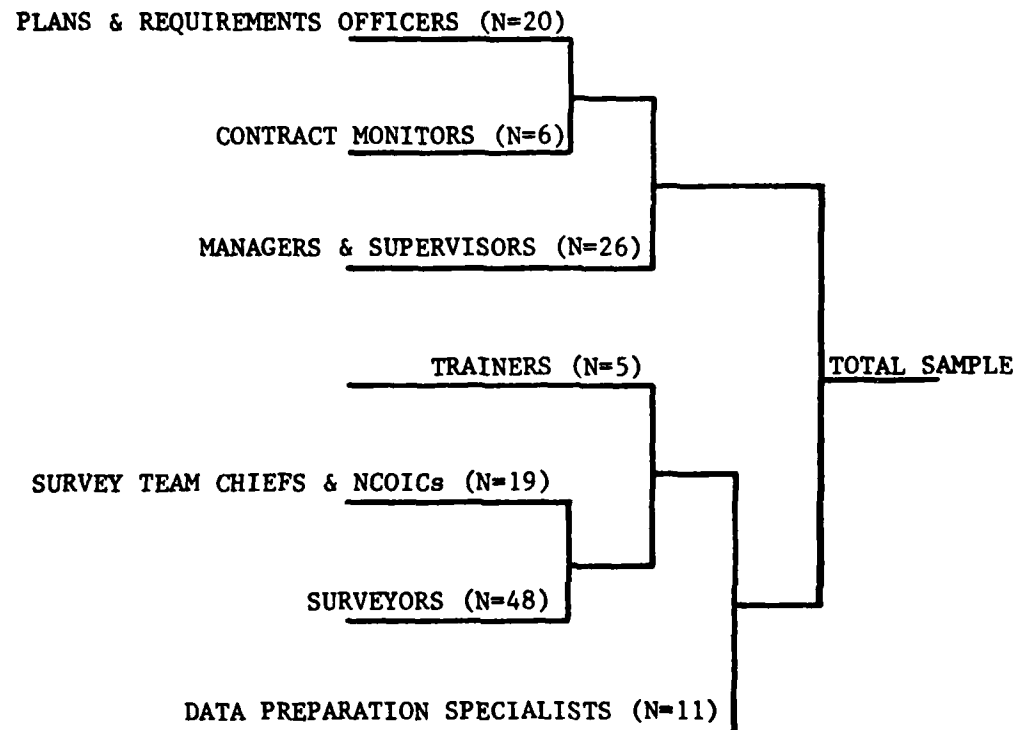


TABLE 6

## RELATIVE PERCENT TIME SPENT

DUTIES	PLANS & REQUIREMENTS (N=20)	CONTRACT MONITORS (N=6)	MANAGERS & SUPERVISORS (N=26)	TRAINERS (N=5)	SURVEY TEAM CHIEFS & NCOs (N=19)	SURVEYORS (N=48)	DATA PREPARATION SPECIALISTS (N=11)
COMMAND & MANAGEMENT	15	7	36	10	16	3	7
PERSONNEL & RESOURCE MGT	9	4	17	3	6	*	3
INSPECTING	2	1	5	-	1	*	*
TRAINING	1	*	7	58	6	2	3
ADMINISTRATION	3	5	4	5	1	*	*
COMMAND MANAGEMENT	16	5	2	*	1	*	5
PERFORMING SURVEYS	1	1	1	17	41	64	13
TDY	3	5	4	-	8	17	*
DATA ANALYSIS	3	2	6	2	4	5	48
SURVEY PROJECT MGT	1	*	3	-	5	1	*
SURVEY PROJECT PLANNING	1	1	*	*	5	4	19
SURVEY TECHNIQUES	-	-	1	-	2	1	-
CONTRACT MANAGEMENT	1	36	2	*	*	*	-
STAFF	26	11	3	-	*	*	1
SECURITY	3	3	4	1	1	*	*
PROGRAM MANAGEMENT	6	9	1	-	*	-	-
PRODUCTION MANAGEMENT	5	2	2	-	*	-	*
RESEARCH MANAGEMENT	1	8	*	-	-	*	-
SUPPLY & EQUIPMENT MGT	1	*	1	4	2	1	*

\* LESS THAN ONE PERCENT

TABLE 7  
SELECTED BACKGROUND INFORMATION

	PLANS & REQUIREMENTS (N=20)	CONTRACT MONITORS (N=6)	MANAGERS & SUPERVISORS (N=26)	TRAINERS (N=5)	SURVEY TEAM CHIEFS & NCOs (N=19)	SURVEYORS (N=48)	DATA PREPARATION SPECIALISTS (N=11)
AVERAGE NUMBER OF TASKS PERFORMED	114	78	100	33	145	48	26
AVERAGE NUMBER OF MONTHS IN CURRENT JOB	26	20	24	14	49	26	10
AVERAGE NUMBER OF MONTHS TAFMS	178	118	185	129	181	87	77

TABLE 8

INDICATORS OF JOB SATISFACTION  
(PERCENT RESPONDING)

	PLANS & REQUIREMENTS (N=20)	CONTRACT MONITORS (N=6)	MANAGERS & SUPERVISORS (N=26)	TRAINERS (N=5)	SURVEY TEAM		DATA PREPARATION SPECIALISTS (N=11)
					CHIEFS & NCOs (N=19)	SURVEYORS (N=48)	
<u>JOB INTEREST:</u>							
I FIND MY JOB INTERESTING	90	83	92	80	95	92	73
<u>UTILIZATION OF TALENTS:</u>							
FAIRLY WELL TO PERFECTLY	100	100	92	80	95	92	54
<u>UTILIZATION OF TRAINING:</u>							
FAIRLY WELL TO PERFECTLY	85	83	69	100	95	83	54
<u>SENSE OF ACCOMPLISHMENT GAINED FROM WORK:</u>							
SATISFIED	95	83	81	40	79	81	73

TABLE 9

EQUIPMENT USED BY AT LEAST ONE-THIRD OF SURVEYOR  
JOB GROUP PERSONNEL

<u>EQUIPMENT</u>	<u>PERCENT OF SURVEY GROUP USING (GRP033)</u>
TRIPOD	96
PROGRAMMABLE CALCULATOR	96
TAPE	96
THEODOLITE (T-0/T-2/T-3/T-3A)	90
RADIOS	88
CAMERAS	83
LEVEL	81
ROD, LEVEL	81
NONPROGRAMMABLE CALCULATOR	75
TRI-PRISM	75
INFARED EDME	71
CHRONOMETER	69
PSYCHRONOMETER	69
MICROWAVE EDME	67
TYPEWRITER	62
THEODOLITE (DKM3AX, DKM3X/RDS)	52
VERTICAL COLLIMATER	48
ROELOF PRISM	42
STRIDING LEVEL	40
GRAVIMETER	37
ALTIMETER	35

### Summary of Job Structure Analysis

Determination of the structure of jobs across the MC&G fields, based on tasks performed, identified seven job groups. Among these job groups, two accounted for the majority of officer respondents (Plans & Requirements (GRP017) and Managers & Supervisors (GRP014)), while two other job groups accounted for the majority of enlisted respondents (Surveyors (GRP033) and Survey Team Chiefs and NCOICs (GRP059)).

The task responses within each job group indicate that officer jobs tend to be relatively diverse. There appear to be a variety of staff and management jobs, generally single authorizations, that have rather broad areas of responsibility. The factors which allowed these jobs to be grouped together related more to the general nature of staff and management functions, rather than the specific MC&G technical tasks. This proliferation of single authorization jobs, coupled with the small size of the Cartographic/Geodetic utilization field, causes many problems in the preparation of relevant classification descriptions and efficient training programs.

The jobs performed by enlisted personnel tend to be more clearly defined and follow the traditional progression from specialist through technician to supervisor. Due to the small number of personnel in the Geodetic Surveyor career field, the more senior personnel (technicians and E7s & E8s) tend to spend considerable percentages of their job time performing many of the same technical surveying tasks as the lower grade respondents.

There is some overlap in certain jobs performed by officer and enlisted respondents. For the surveyor jobs, the overlap is based on a team concept where all members of the team perform many of the tasks in concert to complete an assigned project.

## SPECIALTY ANALYSES

The purpose of this section is to describe the tasks performed by survey respondents based on the existing classification structure. In addition, a variety of background information will be reported and a comparison of the duties and responsibilities from the classification regulations (AFRs 36-1 and 39-1) to the tasks personnel perform will be presented.

CARTOGRAPHIC/GEODETIC OFFICERS - AFSC 5734. The survey sample contained 30 respondents with the Cartographic/Geodetic Officer AFSC. Most of these officers were lieutenants (77 percent) assigned to a variety of major commands or organizations (57 percent to DMA, 17 percent to SAC, and 10 percent to AFSC). These officers reported an average of 17 months in their current jobs, 44 months in the Cartography/Geodesy utilization field, and 72 months total time in service. The educational background for these officers included undergraduate degrees in Earth Science (50 percent) or Cartography (23 percent). Very few reported completing a graduate degree program (20 percent). From the MC&G courses listed in the job inventory, the Mapping, Cartography, and Geodesy Officer Course (MC&GOC) had been attended by 83 percent of these respondents.

In reviewing the computer-generated job description for the Cartographic/Geodetic Officers, the largest percentage of job time was spent performing command and management, and surveying functions; however, no technical MC&G tasks were performed by more than 40 percent of these officers. The tasks performed by the largest percentages of AFS 5734 officers related to processing TDY paperwork or preparing periodic activity reports.

Comparison of the total computer-generated DAFSC 5734 job description with the AFR 36-1 summary of duties and responsibilities revealed some inconsistencies. The emphasis in the specialty description is toward a highly technical cartographic/geodetic management function. The actual tasks performed by survey respondents were so diverse as to barely touch on many of the areas listed in AFR 36-1. For example, the job of the Survey Team Chief is not reflected in the specialty summary or duties and responsibilities. Another facet not covered relates to working in a non-AF environment. More than one-half of the officers surveyed work for DMA, not the typical or traditional environment for junior AF officers.

Finally, for these respondents, an area not mentioned is the requirement for TDY. For the entire group, the average is slightly more than 70 days per year; but, for those assigned to survey functions the average number of days TDY for the year preceeding the data collection for this survey was 246 days.

CARTOGRAPHIC/GEODETIC STAFF OFFICERS - AFSC 5716. The survey sample included 32 personnel with the staff duty AFSC. The majority of these respondents were lieutenant colonels and majors (31 percent each) assigned primarily to DMA (66 percent). These personnel reported an average of 21 months in their current jobs, 129 months in the MC&G utilization field, and 203 months total time in service. The educational background



of these officers included undergraduate degrees in Earth Science (62 percent) and graduate degrees in Business or Management (19 percent). From the MC&G course listed in the job inventory, 47 percent reported attending MC&GOC, 31 percent reported attending the Mapping, Cartography, and Geodesy Senior Officer Course( MC&GSOC), and 16 percent completed the Analytical Photogrammetric Positioning System (APPS) course.

Review of the computer-generated job description for the Staff Officers revealed the majority of their job time was spent performing command, staff, personnel and resource management functions. Tasks listed below illustrate the types of functions performed by Staff Officers.

- Write inputs to regulations, directives, or manuals
- Plan or direct work assignments or workloads
- Analyze workload requirements
- Develop work methods or procedures
- Establish or adjust milestones or suspenses for unit mission activities

Comparison of the computer-generated job description to the AFR 36-1 summary of duties and responsibilities reflected general support by the survey data. The wide variety of jobs performed by Staff Officers can be seen by careful reading of the subparagraphs of the specialty description.

GEODETIC SPECIALIST - AFSC 222X0. The specialty descriptions from AFR 39-1 are intended to provide a broad overview of the duties and tasks performed by personnel at each skill level. Survey data from 46 respondents at the semi-skilled and specialist skill levels were compared to the Geodetic Specialist specialty summary. The responses from these 46 respondents indicate that the summary accurately reflects the jobs and tasks accomplished in the field. Responses from 36 technician skill level respondents similarly support the description contained in the Geodetic Technician summary. A factor not mentioned in the AFR 39-1 classification summaries that would provide a more complete view of geodetic personnel responsibilities relates to the requirement for extensive TDY. Personnel in the Geodetic career ladder reported an average of 130 days TDY in the year preceeding the collection of survey data. AFR 39-1 Specialty Description would be more complete with a reference to the requirement for TDY. Finally, for entry into the Geodetic career ladder, the education qualifications require completion of mathematics through high school trigonometry. Responses from the majority of incumbents at all skill levels validated this educational requirement, 64 percent of the specialist skill level respondents and 75 percent of the technician skill level respondents reported knowledge of trigonometry as the highest level of mathematics required to perform their jobs.

## BACKGROUND INFORMATION

The purpose of this section is to present data on selected items of background information. The information contained in the following tables is generally self-explanatory; however, some trends or observations will be noted.

CARTOGRAPHIC/GEODETIC OFFICERS. Evaluation of responses to the indicators of job satisfaction showed high levels of job interest, utilization of talents and training, and general satisfaction with the sense of accomplishment gained from their work. Additionally, substantial percentages of the officers plan to remain in the Cartographic/Geodetic utilization field.

The issue of TDY, particularly for junior officers, appears to require examination. Lieutenants reported that 86 percent go TDY; the majority report working a greater number of hours than at their home station and that they average 89 days TDY in the past year.

The issue of level of mathematics necessary for officer jobs resulted in a variety of responses across of the grades. A primary reason for the range of responses could be the wide variety of jobs which exist.

ENLISTED GEODETIC SPECIALISTS. Responses to the indicators of job satisfaction indicated high levels of job interest and utilization of personal talents and training. Substantial proportions of the Geodetic personnel plan to reenlist. A rather different aspect of this career field relates to the large percentage of personnel acquisitions through retraining, rather than the normal entry directly from basic training.

As with the officer respondents, the Geodetic Specialists spend a large amount of their time TDY. The average number of days over the past year was in excess of 100 days per individual. A factor which makes TDY for these personnel different from most other AF personnel involves TDY which normally occurs in a nonmilitary environment. Geodetic survey teams seldom are TDY to another military location. The jobs performed while TDY involve a series of movements across a variety of locations. This type of job environment and work requirement is not noted or referenced in any of the career field documents.

The issue of the level of mathematics required for job performance elicited substantial agreement among the enlisted respondents. The majority agreed that mathematics through trigonometry is required.

TABLE 10

AFS 57XX  
JOB INTEREST

	PERCENT RESPONDING				
	<u>LT</u>	<u>CAPT</u>	<u>MAJ</u>	<u>LT COL</u>	<u>COL</u>
INTERESTING	88	100	82	91	100
SO-SO	12	-	18	9	-
DULL	-	-	-	-	-

TABLE 11

AFS 57XX  
UTILIZATION OF TALENTS

	PERCENT RESPONDING				
	<u>LT</u>	<u>CAPT</u>	<u>MAJ</u>	<u>LT COL</u>	<u>COL</u>
FAIRLY WELL TO PERFECTLY	92	100	91	100	100
VERY LITTLE OR NOT AT ALL	8	-	9	-	-

TABLE 12

AFS 57XX  
UTILIZATION OF TRAINING

	PERCENT RESPONDING				
	<u>LT</u>	<u>CAPT</u>	<u>MAJ</u>	<u>LT COL</u>	<u>COL</u>
FAIRLY WELL TO PERFECTLY	64	87	73	82	100
VERY LITTLE OR NOT AT ALL	36	13	27	18	-

TABLE 13

AFS 57XX

SENSE OF ACCOMPLISHMENT

	PERCENT RESPONDING				
	<u>LT</u>	<u>CAPT</u>	<u>MAJ</u>	<u>LT COL</u>	<u>COL</u>
SATISFIED	84	92	64	100	100
NEITHER	4	-	9	-	-
DISSATISFIED	12	7	27	-	-

TABLE 14

AFS 57XX

TECHNICAL COURSE COMPLETED

	PERCENT RESPONDING				
	<u>LT</u>	<u>CAPT</u>	<u>MAJ</u>	<u>LT COL</u>	<u>COL</u>
MC&GOC (G50BD5331)	88	67	46	36	-
MC&GSOC (G50ZD5716)	-	20	27	36	50
DMGED	4	-	9	-	-
AGS (G5AAD22270)	4	-	-	-	-
APPS (G5ASD22150)	8	20	18	9	-
MCGKPO	-	-	-	18	-

TABLE 15

AFS 57XX

CAREER FIELD PLANS

	PERCENT RESPONDING				
	<u>LT</u>	<u>CAPT</u>	<u>MAJ</u>	<u>LT COL</u>	<u>COL</u>
STAY IN AFS 57XX	12	67	82	82	100
CROSS TRAIN & RETURN	64	-	-	-	-
CROSS TRAIN OUT	8	13	-	9	-
UNDECIDED	-	13	-	-	-
SEPARATE	4	-	-	-	-
OTHER	12	7	18	9	-

TABLE 16

AFS 57XX  
UNDERGRADUATE SPECIALIZATION

	PERCENT RESPONDING				
	<u>LT</u>	<u>CAPT</u>	<u>MAJ</u>	<u>LT COL</u>	<u>COL</u>
CARTOGRAPHY	28	-	-	9	-
EARTH SCIENCE	52	47	82	45	50
GEODESY	-	13	-	9	-
MATHEMATICS	4	-	-	18	-
MILITARY SCIENCE	-	-	-	18	-
PHYSICS	-	-	-	-	50
OTHER	16	40	18	11	-

TABLE 17

AFS 57XX  
GRADUATE SPECIALIZATION

	PERCENT RESPONDING				
	<u>LT</u>	<u>CAPT</u>	<u>MAJ</u>	<u>LT COL</u>	<u>COL</u>
BUSINESS OR MANAGEMENT	-	13	18	18	-
CARTOGRAPHY	-	7	-	9	-
GEODESY	-	7	9	18	50
PHYSICS	-	-	9	-	50

TABLE 18

AFS 57XX  
HOURS WORKED PER DAY WHEN TDY

	PERCENT RESPONDING				
	<u>LT</u>	<u>CAPT</u>	<u>MAJ</u>	<u>LT COL</u>	<u>COL</u>
SAME AS AT HOME STATION	24	47	36	27	100
LESS THAN AT HOME STATION	4	6	9	18	-
MORE THAN AT HOME STATION	56	20	27	46	-
DO NOT GO TDY	16	27	18	9	-
NO RESPONSE	-	-	10	-	-

TABLE 19

AFS 57XX  
NUMBER OF MC&G PERSONNEL IN OFFICE

	PERCENT RESPONDING				
	<u>LT</u>	<u>CAPT</u>	<u>MAJ</u>	<u>LT COL</u>	<u>COL</u>
INCUMBENT ONLY	24	40	27	18	-
2-5	44	53	55	82	100
6-10	24	-	-	-	-
11-20	8	7	9	-	-
MORE THAN 21	-	-	9	-	-

TABLE 20

AFS 57XX  
LEVEL OF MATHEMATICS REQUIRED

	PERCENT RESPONDING				
	<u>LT</u>	<u>CAPT</u>	<u>MAJ</u>	<u>LT COL</u>	<u>COL</u>
ARITHMETIC	24	20	9	18	-
ALGEBRA	12	20	-	9	-
STATISTICS	8	13	18	36	50
GEOMETRY	-	7	-	-	-
TRIGONOMETRY	20	-	37	9	-
CALCULUS	36	40	36	27	50

TABLE 21

AFS 57XX  
AMOUNT OF TDY IN THE PAST YEAR

	<u>PERCENT WHO DID NOT TRAVEL</u>	<u>AVERAGE # DAYS TDY</u>	<u>RANGE</u>
LIEUTENANTS (N=25)	16	89	5-327
CAPTAINS (N=15)	27	38	5-110
MAJORS (N=11)	18	25	5-100
LIEUTENANT COLONELS (N=11)	9	33	5-50
COLONELS (N=2)	-	20	10-30

TABLE 22

AFSC 222X0  
JOB INTEREST

	<u>PERCENT RESPONDING</u>		
	<u>DAFSC 22230</u>	<u>DAFSC 22250</u>	<u>DAFSC 22270</u>
INTERESTING	100	87	88
SO-SO	-	11	6
DULL	-	2	6

TABLE 23

AFSC 222X0  
UTILIZATION OF TALENTS

	<u>PERCENT RESPONDING</u>		
	<u>DAFSC 22230</u>	<u>DAFSC 22250</u>	<u>DAFSC 22270</u>
FAIRLY WELL TO PERFECTLY	100	79	86
VERY LITTLE OR NOT AT ALL	-	71	14

TABLE 24

AFSC 222X0  
UTILIZATION OF TRAINING

	<u>PERCENT RESPONDING</u>		
	<u>DAFSC 22230</u>	<u>DAFSC 22250</u>	<u>DAFSC 22270</u>
FAIRLY WELL TO PERFECTLY	100	73	86
VERY LITTLE OR NOT AT ALL	-	27	14

TABLE 25

AFSC 222X0  
SENSE OF ACCOMPLISHMENT

	PERCENT RESPONDING		
	DAFSC 22230	DAFSC 22250	DAFSC 22270
SATISFIED	100	8	61
NEITHER	-	11	8
DISSATISFIED	-	11	31

TABLE 26

AFSC 222X0  
REENLISTMENT INTENT

	PERCENT RESPONDING		
	DAFSC 22230	DAFSC 22250	DAFSC 22270
DEFINITELY WILL REENLIST	-	14	30
PROBABLY WILL REENLIST	100	75	42
PROBABLY WILL NOT REENLIST	-	11	11
DEFINITELY WILL NOT REENLIST	-	-	-
WILL RETIRE	-	-	17

TABLE 27

AFSC 222X0  
HOW ASSIGNED TO CAREER LADDER

	PERCENT RESPONDING		
	DAFSC 22230	DAFSC 22250	DAFSC 22270
COMPLETED RESIDENT TECHNICAL TRAINING	-	43	33
RETRAINED	100	45	44
OTHER	-	12	22



TABLE 28

AFSC 222X0  
HOURS WORKED PER DAY WHEN TDY

	PERCENT RESPONDING		
	DAFSC 22230	DAFSC 22250	DAFSC 22270
SAME AS HOME STATION	-	4	-
LESS THAN HOME STATION	-	2	-
MORE THAN HOME STATION	100	89	78
DO NOT GO TDY	-	2	19
NO RESPONSE	-	-	2

TABLE 29

AFSC 222X0  
AMOUNT OF TDY IN PAST YEAR

	PERCENT RESPONDING		
	DAFSC 22230	DAFSC 22250	DAFSC 22270
PERCENT WHO DO NOT TRAVEL	0	2	19
AVERAGE NUMBER OF DAYS TDY	194	126	121
RANGE OF TDY DAYS	13-195	8-320	20-310

TABLE 30

AFSC 222X0  
NUMBER OF MC&G PERSONNEL IN OFFICE

	PERCENT RESPONDING		
	DAFSC 22230	DAFSC 22250	DAFSC 22270
INCUMBENT ONLY	-	4	6
2-5	-	21	33
6-10	50	41	25
11-20	50	30	30

TABLE 31

AFSC 222X0  
LEVEL OF MATHEMATICS REQUIRED

	<u>PERCENT RESPONDING</u>		
	<u>DAFSC 22230</u>	<u>DAFSC 22250</u>	<u>DAFSC 22270</u>
ARITHMETIC	-	11	8
ALGEBRA	-	7	3
STATISTICS	-	-	3
GEOMETRY	-	11	3
TRIGONOMETRY	100	64	75
CALCULUS	-	7	8

Review of the educational background of the junior officers revealed the majority had completed undergraduate programs specializing in earth science, cartography, or geodesy (see Table 16 in the BACKGROUND INFORMATION section). Discussions with some junior officers during development of the job inventory revealed that many found portions of the MC&GOC applicable to their jobs, but found the bulk of the course of little value. For example, the block of instruction related to Surveying Operations was considered useful by those serving as Survey Team Chiefs, but not particularly applicable for personnel performing other jobs. The small numbers of personnel, wide variety of jobs, and working outside of the normal AF environment make establishing of a cost-effective highly relevant training program extremely difficult.

In general, the information contained in blocks A, B, C thru J appears supported by the jobs and tasks performed by AFS 57XX officers. Survey data indicate that junior officers perform jobs as Survey Party Team Chiefs, Target Intelligence Officers, or a variety of staff officer functions. A major factor affecting the relevance of training to the entry-level jobs of AFS 57XX officers is the small number of personnel compared to the diversity of jobs. The survey sample included 25 lieutenants, and among those lieutenants, four tasks were performed by at least one-half (all of which were administrative or TDY related).

- A - Introduction to MC&G
- B - MC&G Survey Operations
- C - Remote Sensing
- D - MC&G Photogrammetric Operations
- E - MC&G Cartographic Operations
- F - MC&G Graphic Arts Operations
- G - Military Geographic Information
- H - General Subjects
- I - Small Unit Activities
- J - Area Requirements

The MC&GOC (G50BD5734) encompasses 454.5 hours of instruction divided into the 10 blocks of instruction listed below:

#### Officer Course

Occupational survey data serve as a primary source in development, validation, and modification of training programs. Factors which may be used in assessing entry-level training needs include the percentage of personnel who use that training shortly after training is given. To assess the relevance of training given to entry-level Cartographic/Geodetic Officers and Geodetic Specialists, survey data were compared to the plans of instruction for the Mapping, Charting, and Geodesy Officer Course (MC&GOC), and the Basic Geodetic Survey Course (BGS), both conducted by the Defense Mapping School at Ft Belvoir VA.

#### TRAINING ANALYSIS

### Enlisted Course

The BGS course (E5ABD22230) encompasses 589 academic hours (614 total hours) of instruction for Air Force personnel divided into the nine blocks of instruction listed below:

- A - Recovery of Survey Control
- B - Direction Measurement
- C - Distance Measurement
- D - Differential Leveling
- E - Grid Systems and Computations
- F - Traverse
- G - Triangulation
- J - Astronomic Surveys
- K - Geodetic Surveying and Computations

In general, information contained in the BGS course appears well supported by occupational survey data. The majority of Geodetic Specialists, personnel with a duty AFSC of 222X0, performed jobs as Geodetic Surveyors (51 percent as surveyors and 18 percent as team chiefs or NCOICs). All of the enlisted survey respondents in their first enlistment (five respondents) and all of the enlisted survey respondents with less than four years in the Geodetic career field (34 personnel) performed jobs as Geodetic surveyors or data preparation specialists.

### Equipment

Review of the equipment required for each of the two entry-level courses provides additional insight into the relevance of training. Of the 19 items of equipment listed for the MC&GOC (Table 32), only one (the calculator) was used by more than 50 percent of the lieutenants in the survey sample. Of the six items of equipment required for the BGS course (Table 33), only one was utilized by a small percentage of respondents. These data seem to reinforce the need for review of much of the training given in the officer course and to validate much of the training given in the enlisted survey course.

TABLE 32  
EQUIPMENT USED BY AFS 57XX LIEUTENANTS

<u>EQUIPMENT USED IN MC&amp;GOC</u>	<u>PERCENT USING LIEUTENANTS (N=25)</u>
CALCULATOR, PROGRAMMABLE	52
CALCULATOR, NONPROGRAMMABLE	52
RADIO RECEIVERS	32
TAPE	28
GRAVIMETERS	24
T2 OR T3 THEODOLITE	20
LEVEL	16
LEVEL RODS	16
EDME, MICROWAVE	16
CHRONOMETER	16
EDME, INFARED	8
GEOCEIVER	8
ALTIMETER	4
CURRENT METER	4
T-4 THEODOLITE	4
DKM-3M THEODOLITE	4
BOTTOM SAMPLER	0
FATHOMETER	0
THERMOGRAPH	0

TABLE 33  
EQUIPMENT USE BY AFSC 222X0 RESPONDENTS

EQUIPMENT USED IN BGS COURSE	PERCENT USING		
	DAFSC 22230 (N=2)	DAFSC 22250 (N=44)	DAFSC 22270 (N=36)
EDME, INFARED	100	59	67
EDME, MICROWAVE	100	52	58
LEVEL	100	66	72
THEODOLITE (T-0, T-2, T-3, T-3A)	100	80	75
ALAI DADE, TELESCOPIC	50	9	11
CALCULATOR, NONPROGRAMMABLE	50	68	78

## IMPLICATIONS

Analysis of the occupational survey data from Cartographic/Geodetic officers and enlisted Geodetic Specialists resulted in descriptions of a variety of jobs performed by incumbents and the relationship of these jobs to present classification documents and entry-level training programs.

The job structure analysis identified a number of different jobs. With the exception of some supervisory jobs, there was a distinct difference between the jobs performed by officers and enlisted respondents. Officer jobs tended to vary considerably around the basic functions of planning, definition of requirements, contract monitoring, and management. Jobs performed by enlisted respondents tended to be more narrowly defined in terms of geodetic surveying and data preparation.

For both officer and enlisted specialties, there was a reasonably close relationship between the specialty descriptions contained in AFR 36-1 and AFR 39-1 and the jobs which exist, with a need for some refinements in the areas of extensive TDY and diversity of jobs. The training program for entry-level officers, MC&GOC, does not relate to the jobs performed primarily due to the variety of jobs which exist. The need for management intervention for the MC&G officer force centers on a wide variety of jobs and a small population of officers. The numbers of officers are so small as to offer the potential for no experienced career force to exist. Many younger officers felt the potential for promotion within the field was such that they would cross-train to gain AF experience. The need for a relatively large company grade officer force to sustain a career force could reduce the potential for cross-training and provide potential staff officers with a variety of assignments upon which to build their experience and knowledge base. The training program for entry-level enlisted personnel appears fairly well related to the job performed by the majority of personnel.

There was general satisfaction by survey respondents with their jobs and the utilization of the training. Career plans for both officer and enlisted respondents generally were positive, with substantial percentages planning to remain in the MC&G fields. Review of the background information revealed one area of concern; namely, the requirement for extensive TDY.

The purpose of this occupational survey was to identify job structure, document career field management needs, and outline training needs. The job structure reveals of a variety of officer jobs which reflect a need for management intervention to provide personnel with the education and training background capable of performing those jobs. For the enlisted force, management intervention may be necessary to alleviate any problems associated with extensive TDY.

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