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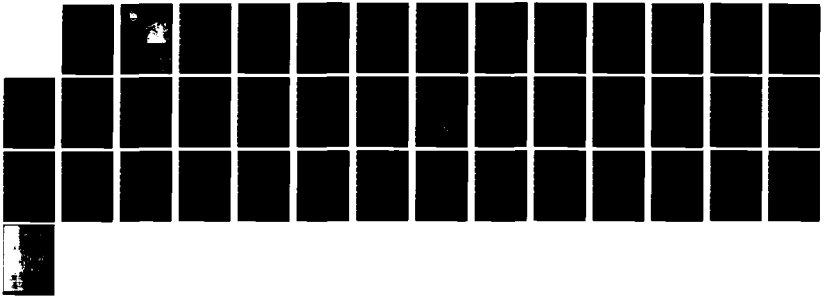

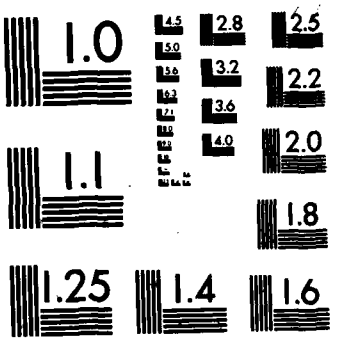

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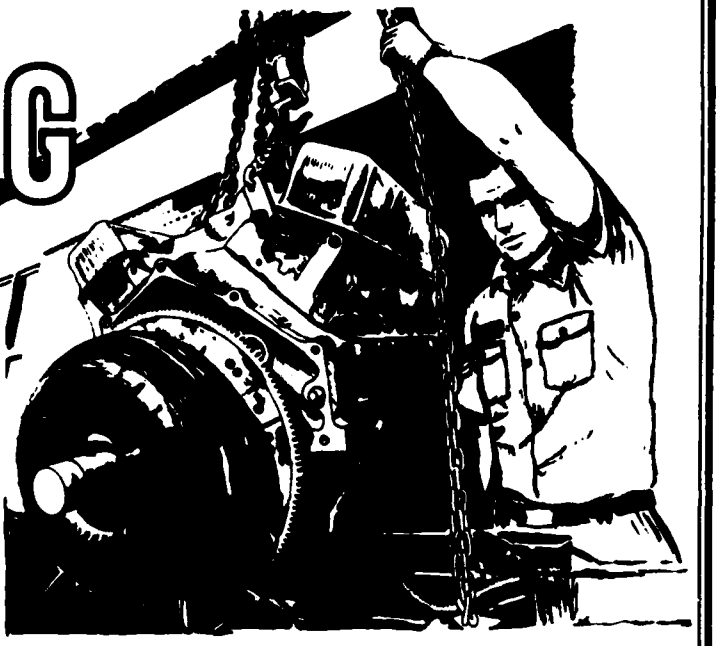

BASE VEHICLE EQUIPMENT MECHANIC
CAREER LADDER

AFSCs 47230, 47250, AND 47271
AFPT 90-472-442
MARCH 1983

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

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HQ MAC/DPAT	3	3	3
HQ PACAF/DPAL	1	1	1
HQ PACAF/DPAT	3	3	3
HQ SAC/DPAT	3	3	3
HQ SAC/LGMQ (ATCLO)	1	1	1
HQ TAC/DPAT	3	3	3
HQ TAC/DPLATC	1	1	1
HQ USAF/LET	1		1
HQ USAF/MPPT	1		1
HQ USAFE/DPAT	3	3	3
HQ USAFE/DPATC	1	1	1
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PREFACE

This report presents the results of a detailed Air Force Occupational Survey involving the training requirements for first-enlistment personnel in the Base Vehicle Equipment Mechanic (AFS 472X0) specialty. The project was initiated in response to a need for current job information in the career field. Authority for conducting occupational surveys is contained in AFR 35-2. Computer printouts from which this report was produced are available for use by operational and training officials.

Chief Master Sergeant Robert M. Wing, Inventory Development Specialist, developed the survey instrument for this project. Ms Lynn D. Baker and Ms Elena J. Weber analyzed the data and wrote the final report. Computer products for this report were generated by Mr Bill Feltner and Ms Olga Velez. This report has been reviewed and approved by Lieutenant Colonel Jimmy L. Mitchell, Chief, Airman Career Ladders Analysis Section, USAF Occupational Measurement Center, Randolph Air Force Base, Texas 78150.

Copies of this report are distributed to the organizations shown on page i. Additional copies may be obtained by contacting the USAF Occupational Measurement Center, attention to the Chief, Occupational Analysis Branch (OMY), Randolph Air Force Base, Texas 78150.

This report has been reviewed and is approved.

PAUL T. RINGENBACH, Colonel, USAF
Commander
USAF Occupational Measurement Center

WALTER E. DRISKILL, Ph.D
Chief, Occupational Analysis Branch
USAF Occupational Measurement Center

SUMMARY OF RESULTS

1. Survey Objective: The purpose of this report is to provide occupational survey data to use in assessing current Base Vehicle Equipment Mechanic training documents and programs involving first-enlistment 472XO personnel.

2. Survey Coverage: Training emphasis and task difficulty ratings were collected from senior AFSC 47250 (Base Vehicle Equipment Mechanic) personnel and AFSC 47271 (Special Vehicle and Base Vehicle Equipment Supervisor) members to help identify both common and vehicle-specific training requirements.

3. Analysis of First-Enlistment Personnel: Tasks performed by the majority of first-enlistment personnel were not specific to any one particular type of vehicle. Additionally, members maintained not only base vehicles but also a wide variety of other types of vehicles and equipment. Some minor differences between first-enlistment MAJCOM groups were found on the tasks performed and vehicles maintained.

4. Training Analysis: Generally, nonvehicle-specific tasks common to all types of vehicles received higher training emphasis ratings than base vehicle-specific tasks. Current STSs for 47230/50 and 47271 personnel provide good coverage of most functions performed with some areas in need of review. Generally, the POI was supported by survey data. Some areas and tasks, however, were suggested for review.

5. Summary and Implications: Before training documents and programs are revised, the issue of cross-utilization among the vehicle maintenance specialties should be addressed. A Utilization and Training workshop on all vehicle maintenance specialties may be necessary to address the utilization issues and to assess current and projected training needs and programs.

TRAINING REPORT
BASE VEHICLE EQUIPMENT MECHANIC SPECIALTY
(AFS 472X0)

INTRODUCTION

This is a report of a training analysis of the Base Vehicle Equipment Mechanic specialty (AFS 472X0), completed by the Occupational Analysis Branch, USAF Occupational Measurement Center, in January 1983. The survey was initiated to obtain current task and background data for use in the evaluation and management of training programs for this career ladder. Analyses of the job structure, DAFSC groups, AFR 39-1 specialty descriptions, job satisfaction, CONUS and Overseas groups, MAJCOM groups, and utilization of Vehicle Maintenance personnel were covered in an Occupational Survey Report (OSR) published in August 1982. Separate training reports on the Special Vehicle Mechanic (AFS 472X1A/B/C/D), General Purpose Vehicle Mechanic (AFS 472X2), and Vehicle Body Mechanic (AFS 472X3) specialties are also available.

Background

The Vehicle Maintenance career field (excluding AFS 472X4 - Vehicle Maintenance Control and Analysis), currently consists of seven separate AFSs through the 5-skill level. These seven AFSs merge into two AFSs at the 7-skill level (AFSC 47271 - Special Vehicle and Base Vehicle Equipment Supervisor and AFSC 47275 - General Purpose Vehicle and Body Maintenance Supervisor); additionally, there is a common 47299 (Vehicle Maintenance Superintendents) and CEM Code 47200 (Vehicle Maintenance Managers). As described in AFR 39-1, AFS 472X0 (Base Vehicle Equipment Mechanics) personnel are responsible for inspecting, maintaining, and repairing base vehicles and equipment, such as backhoes, dump trucks, and self-propelled graders. AFS 472X0 members, along with Special Vehicle Mechanics (AFSs 472X1A/B/C/D), are supervised by AFS 47271 personnel.

Entry into the 472X0 career ladder is either by direct-duty assignment (DDA), retraining, or through a Category B basic technical training course (C3ABR47230) at Chanute AFB, Illinois. This course lasts 60 days and includes inspecting, servicing, testing, adjusting, troubleshooting, disassembly, and reassembly of engines, automotive electrical systems, power trains, steering systems, track and suspension systems, hydraulic systems, and attachments of base vehicle equipment; emphasis on use of technical and standard publications; familiarization with organizational and intermediate-level maintenance, maintenance and man-hour accounting forms, maintenance systems, and maintenance documentation as applicable to base vehicle equipment.

Objectives

This training report provides task data training managers can use in conjunction with career ladder documents to assess the effectiveness of Base Vehicle Equipment Mechanic (AFS 472X0) training. Topics discussed in this report include: (1) survey methodology; (2) tasks performed, vehicles maintained, and tools and equipment used by first-enlistment 472X0 personnel; (3) comparison of MAJCOM first-enlistment differences; and (4) assessment of the 3- and 5-skill level 472X0 STS, the 47271 STS, and the 472X0 POI.

SURVEY METHODOLOGY

Inventory Development

The data collection instrument for this occupational survey was USAF Job Inventory AFPT 90-472-442, dated April 1981. The job inventory contains task statements covering seven Vehicle Maintenance career ladders (AFSs 472X0 - Base Vehicle Equipment Mechanic, 472X1A/B/C/D - Special Vehicle Mechanic, 472X2 - General Purpose Vehicle Mechanic, and 472X3 - Vehicle Body Mechanic) plus the Vehicle Maintenance Superintendent (AFSC 47299) and the Vehicle Maintenance Manager (CEM Code 47200). A preliminary task list was prepared after reviewing pertinent career ladder publications and directives, tasks from previous inventories, and data from the last OSR. This preliminary task list was refined and validated through personal interviews with 17 subject-matter specialists at three bases. The resulting job inventory contained a comprehensive listing of 773 tasks grouped under 23 duty headings and a background section containing such information as grade, TAFMS, job title, work area, equipment maintained, and job interest.

Job Inventory Administration

During the period April through October 1981, Consolidated Base Personnel Offices (CBPOs) in operational units worldwide administered the inventory to job incumbents with AFSs 472X0 (Base Vehicle Equipment Mechanic), 472X1A/B/C/D (Special Vehicle Mechanic), 472X2 (General Purpose Vehicle Mechanic), 472X3 (Vehicle Body Mechanic), 47299 (Vehicle Maintenance Superintendent), and CEM Code 47200 (Vehicle Maintenance Manager). These job incumbents were selected from a computer-generated mailing list obtained from personnel data tapes maintained by the Air Force Human Resources Laboratory (AFHRL).

Each inventory respondent first completed an identification and biographical information section, then checked each task performed in their current job. After checking all tasks performed, each member then rated each of these tasks on a nine-point scale indicating the relative time spent on that particular task as compared to all other tasks checked. The ratings ranged from one (very small amount of time spent) through five (about average time spent) to nine (very large amount of time spent).

To determine relative time spent for each task checked by a respondent, all of an incumbent's ratings are assumed to account for 100 percent of his or her time spent on the job and are summed. Each task rating is then divided by the total task ratings and multiplied by 100. This procedure provides a basis for comparing tasks in terms of both percent members performing and average percent time spent.

The information collected was used to compare personnel based on the types of tasks they performed and the relative amount of time they spend performing the tasks. Job inventory data provided the basis for analyzing

the job structure of the Vehicle Maintenance specialties and making comparisons between DAFSC groups, CONUS-Overseas groups, MAJCOM groups, and job satisfaction indicators. A summary of the analyses of the data is presented in the Occupational Survey Report (OSR) for the Base Vehicle Equipment (AFS 472X0), Special Vehicle (AFS 472X1A/B/C/D), General Purpose Vehicle (AFS 472X2), and Vehicle Body Mechanics (AFS 472X3) career ladders, AFPT 90-472-442, dated August 1982. In addition to using job inventory data for the OSR, percent members performing data for first-enlistment 472X0 specialty groups are presented in this training report along with recently collected task factor ratings.

Task Factor Administration

Due to the complexity and size of this study, the decision was made not to collect task difficulty and training emphasis data at the same time as tasks performed data were collected. For use in this report, task difficulty and training emphasis booklets were administered to selected senior 47250 (Base Vehicle Equipment Mechanic) and 47271 (Special Vehicle and Base Vehicle Equipment Supervisor) personnel during the period of April through August 1982. This information is used in a number of different analyses discussed in more detail within this report.

Task Difficulty. Each person completing a task difficulty booklet was asked to rate all inventory tasks on a nine-point scale (from extremely low to extremely high) as to relative difficulty. Difficulty is defined as the length of time required by an average member to learn to do the task. For the purposes of this report, two sets of task difficulty data were computed: one for the 472X0 career ladder and one for the 47271 specialty. To obtain task difficulty ratings for the 472X0 career ladder, ratings from senior 5-skill level 472X0 respondents and from 47271 members who supervised AFS 472X0 personnel were used. The interrater agreement (as assessed through components of variance of standard group means) for this group of 61 raters was .96, indicating very high agreement among the raters. Ratings from all 47271 members were used to obtain task difficulty ratings for the 47271 specialty. The interrater agreement for this group of 70 members was .96, also reflecting high agreement among the raters. Ratings were adjusted so tasks of average difficulty would have a 5.00 rating. The resulting data is essentially a rank ordering of tasks indicating the degree of difficulty for each task in the inventory.

Training Emphasis. Individuals completing training emphasis booklets were asked to rate tasks on a ten-point scale from no training required to extremely heavy training required. Training emphasis is a rating of which tasks require structured training for first-term personnel. Structured training is defined as training provided at resident technical schools, field training detachments (FTD), mobile training teams (MTT), formal OJT, or any other organized training method. For the purpose of this report, ratings from senior 5-skill level 472X0 respondents and from 47271 members who supervised AFS 472X0 personnel were used to obtain training emphasis ratings for the 472X0 career ladder. The interrater agreement (as assessed through components of variance of standard group means) for this group of 109 raters

was .98, indicating good agreement among raters as to which tasks required some form of structured training and which did not. In the 472X0 ladder, tasks rated highest in training emphasis had a rating of 5.28 and above, with an average training emphasis rating of 3.54.

Like task difficulty, training emphasis ratings provide objective information which should be used along with percent members performing data when making training decisions. Percent members performing data provide information on who and how many personnel perform the tasks. Task difficulty ratings help make decisions on which tasks may require more training time, and training emphasis indicates the tasks which are important in first-enlistment formal training programs. Using these factors in conjunction with appropriate training documents and directives, career field managers can tailor training programs to accurately reflect the needs of the user by more effectively determining when, where, and how to train first-enlistment 472X0 airmen.

Survey Sample

As indicated previously, the administration of the AFS 472XX job inventory, task difficulty, and training emphasis booklets involved three separate survey samples. Table 1 reflects the percentage distribution, by major command, of assigned personnel in the 472X0 career ladder as of the first half of FY1982. Also presented in this table is the percent distribution, by major command, of respondents in the final task difficulty and training emphasis samples.

TABLE 1

COMMAND DISTRIBUTION OF 472X0 TASK DIFFICULTY AND TRAINING EMPHASIS RATERS

COMMAND	472X0* PERCENT OF ASSIGNED (N=518)	47271 PERCENT OF ASSIGNED (N=379)	PERCENT OF TASK DIFFICULTY RATERS (N=61)	PERCENT OF TRAINING EMPHASIS RATERS (N=109)
TAC	25	21	16	30
SAC	21	18	23	21
USAFE	12	19	21	18
MAC	10	12	10	12
PACAF	9	9	13	6
AAC	8	4	2	2
ATC	5	9	10	5
AFSC	4	3	2	5
OTHER	6	5	3	1
TOTAL	100	100	100	100

*AFSCs 472X0 INCLUDES ALL 3- AND 5-SKILL LEVEL PERSONNEL

ANALYSIS OF FIRST-ENLISTMENT PERSONNEL

Before efficient and cost effective training programs can be designed for a career ladder, the jobs and tasks performed by personnel within the career ladder must be defined. Of particular importance are the jobs and tasks performed by first-enlistment personnel since they are the "target" for basic skills training. Thus, this report will focus on the tasks performed by first-enlistment personnel.

To determine the basic functions performed by first-enlistment (1 to 48 months TAFMS) Base Vehicle Equipment Mechanics, an analysis of the tasks, jobs, vehicles maintained, and tools and equipment used by these members was performed. Additionally, since major command (MAJCOM) assignment is another possible dimension along which jobs performed by respondents could vary, a comparison of the tasks performed and vehicles maintained by various first-enlistment MAJCOM groups was made. These data used in conjunction with training emphasis and task difficulty ratings can help identify training needs for first-term Base Vehicle Equipment Mechanics.

AFS 472X0 First-Enlistment Personnel

Tasks and Jobs Performed. First-enlistment Base Vehicle Equipment Mechanics spent the majority of their job time performing technical tasks related to repairing, maintaining, inspecting, and servicing vehicle systems and system components. The majority of tasks performed by these members are not related to any one specific type of vehicle but rather are nonvehicle specific in nature, and include tasks related to various types of vehicle systems. Typical tasks include adjusting, servicing, removing, installing, and inspecting parts and components on vehicle electrical systems; adjusting brakes and belts; servicing air cleaners and drive belts; and lubricating vehicles (see Table 2 for a more comprehensive display of representative tasks). Of the 41 base vehicle-specific tasks in the job inventory, the three tasks listed below were the only ones performed by 30 percent or more of first-enlistment members.

Adjusting crane brakes or clutches
Removing or installing sweeper blower assemblies
Removing or installing crane brakes or clutches

Figure 1 displays the distribution of first-term 472X0 members across the job groups identified in the JOB STRUCTURE ANALYSIS section of the Base Vehicle Equipment, Special Vehicle, General Purpose Vehicle, and Vehicle Body Mechanic OSR. As shown in this figure, the majority of first-enlistment 472X0 personnel grouped together in the Vehicle Repair Mechanics functional area. Within this functional area, 69 percent were concentrated in the General Repair Mechanics job group, along with members from other vehicle maintenance specialties. Other first-enlistment members performed variations of the Vehicle Repair Mechanic job. These variations were small and centered primarily around more job time being spent on one vehicle system versus

TABLE 2

REPRESENTATIVE TASKS PERFORMED BY AFSC 472X0 FIRST-ENLISTMENT (1-48 MONTHS TAFMS) PERSONNEL

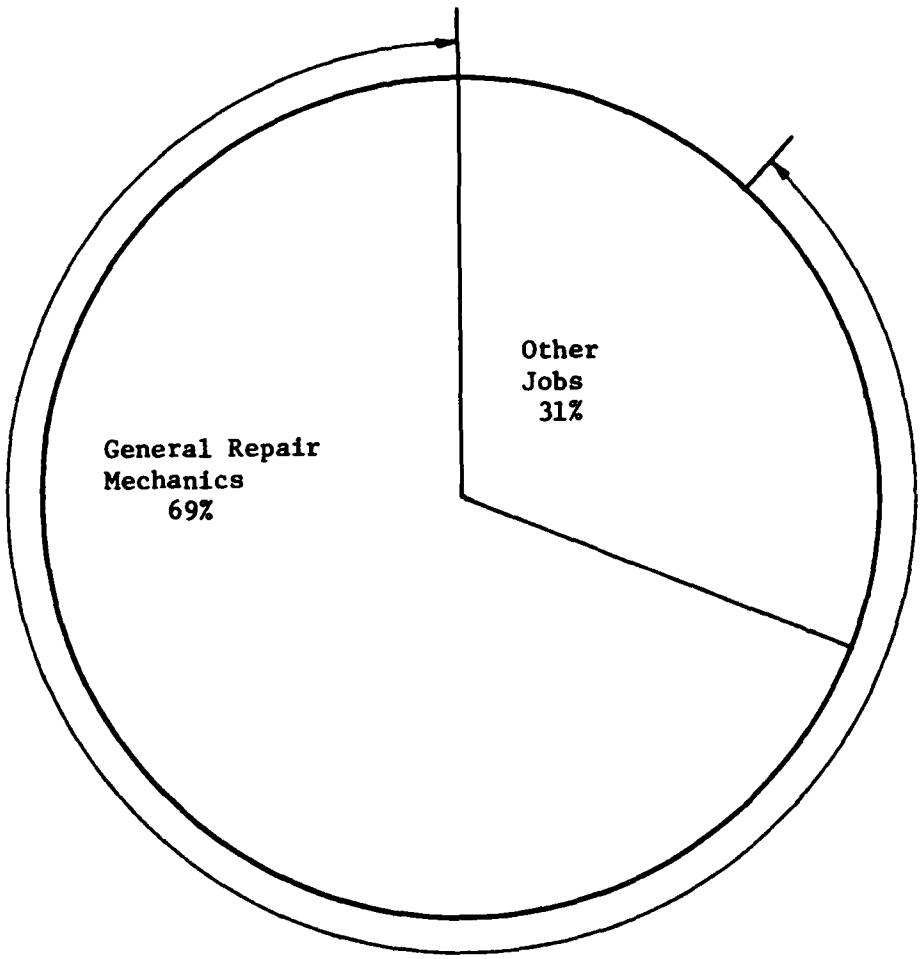
TASKS		PERCENT MEMBERS PERFORMING (N=172)
H244	SERVICE AIR CLEANERS	92
H215	ADJUST ENGINE DRIVE BELTS	91
I288	REMOVE OR INSTALL BATTERIES	90
N484	PACK WHEEL BEARINGS	90
0522	ADJUST PARKING BRAKES	88
I315	SERVICE BATTERIES	88
I308	REMOVE OR INSTALL SPARK PLUGS	88
L424	REMOVE OR INSTALL RADIATORS	88
I266	INSPECT CHARGING SYSTEM	87
I287	REMOVE OR INSTALL ALTERNATORS	87
0523	ADJUST SERVICE BRAKES	86
I257	ADJUST IGNITION POINTS USING FEELER GAUGES	86
H246	SERVICE ENGINE OIL SYSTEMS	86
G193	LUBRICATE VEHICLES	85
I265	INSPECT BATTERIES	85
K395	SERVICE FUEL FILTERS	85
N499	REMOVE OR INSTALL FRONT WHEEL BEARINGS	85
I269	INSPECT STARTING SYSTEMS	84
M433	ADJUST CLUTCH PEDAL FREE PLAY	84
K378	REMOVE OR INSTALL CARBURETORS	84
I268	INSPECT LIGHTING SYSTEM	84
0525	BLEED OR FLUSH BRAKE SYSTEMS	83
I282	PERFORM BATTERY HYDROMETER TESTS	83
H227	REMOVE OR INSTALL ENGINE DRIVE BELTS	82
L430	TEST STRENGTH OF ANTIFREEZE SOLUTION	82
I267	INSPECT IGNITION SYSTEMS	82
H245	SERVICE ENGINE DRIVE BELTS	82
I264	CHARGE BATTERIES	81
I299	REMOVE OR INSTALL IGNITION POINTS	81
K355	ADJUST THROTTLE LINKAGES	81
I311	REMOVE OR INSTALL VEHICLE LIGHT ASSEMBLIES	81
H219	INSPECT ENGINE PARTS	80
I297	REMOVE OR INSTALL GENERATORS OR STARTER MOTORS	80
I317	SET IGNITION TIMING	80
0545	REMOVE OR INSTALL BRAKE SHOES	80
I293	REMOVE OR INSTALL ELECTRICAL SYSTEM SWITCHES	79
I279	ISOLATE STARTER SYSTEM MALFUNCTIONS	79
N500	REMOVE OR INSTALL GREASE SEALS	78
L426	REMOVE OR INSTALL WATER PUMPS	78
H249	TEST CYLINDER COMPRESSION IN GASOLINE ENGINE	78
I298	REMOVE OR INSTALL IGNITION COILS	77

TABLE 2 (CONTINUED)

REPRESENTATIVE TASKS PERFORMED BY AFSC 472X0 FIRST-ENLISTMENT (1-48 MONTHS TAFMS) PERSONNEL

TASKS		PERCENT MEMBERS PERFORMING (N=172)
I270	INSPECT WARNING SYSTEMS	77
I307	REMOVE OR INSTALL SOLENOIDS	77
L423	REMOVE OR INSTALL HEATING OR COOLING SYSTEM HOSES	77
I277	ISOLATE LIGHTING SYSTEM MALFUNCTION	77
N497	REMOVE OR INSTALL DRIVE SHAFT	76
I273	ISOLATE CHARGING SYSTEM MALFUNCTIONS	76
0544	REMOVE OR INSTALL BRAKE HOSES OR LINES	76
N480	INSPECT DRIVE SHAFT COMPONENTS	75
H228	REMOVE OR INSTALL ENGINES	75
H220	INSPECT MOTOR MOUNTS	75
I303	REMOVE OR INSTALL PRESSURE SENDING UNITS	75

FIGURE 1
DISTRIBUTION OF 472X0 FIRST ENLISTMENT PERSONNEL
ACROSS CAREER FIELD JOBS
(PERCENT MEMBERS RESPONDING)
(N=172)



Vehicle Repair Mechanics (88%)

another system. There were no job groups identified which contained only AFS 472X0 members indicating a large degree of commonality between AFS 472X0 members and members in other vehicle maintenance specialties.

Vehicles Maintained. As shown in Tables 3 and 4, first-enlistment 472X0 members maintain not only base vehicles and equipment, but also vehicles which are the responsibility of members in other vehicle maintenance specialties. Although a large percentage of first-term 472X0 members are maintaining a wide variety of base vehicles and equipment (see Table 3), some did indicate repairing and maintaining towing and servicing vehicles, general purpose vehicles, and materials handling equipment (see Table 4). (Additional vehicles maintained by first-enlistment personnel are presented in the Training Extract for this report.) The vehicle maintained data and the percent members performing data both show a lack of specialization on one type of vehicle by first-enlistment 472X0 personnel, and indicate training should cover various types of systems and system components common to a wide variety of vehicles.

Tools and Equipment Used. Of the first-enlistment 472X0 members, 96 percent indicated using maintenance tools or equipment in the performance of their present job. Out of the 17 specific tools or equipment listed in the inventory, nine were used by ten percent or more of Base Vehicle Equipment first-enlistment personnel. These nine are displayed in Table 5 to assist trainers in assessing maintenance tools and equipment that might best be used or taught in courses.

Analysis of First-Enlistment MAJCOM Differences

Tasks performed, vehicles maintained, and tools and equipment used by personnel within the six major commands (MAJCOM) with the largest first enlistment 472X0 population were compared to determine whether job content varied as a function of MAJCOM assignment. The six commands examined in this analysis included TAC, SAC, USAFE, MAC, PACAF, and AAC.

Tasks Performed. On tasks performed, differences between the six MAJCOM groups occurred mainly on base vehicle-specific maintenance tasks. As shown in Table 6, more of the first-enlistment members assigned to AAC performed these tasks than first enlistement members assigned to other commands. This is especially true on tasks related to adjusting, rebuilding, removing, or installing snowplow attachments. On tasks performed in other duty areas, differences between members in the six commands were small.

Vehicles Maintained. In terms of types and numbers of vehicles maintained, only minor differences were found between the six MAJCOM first-term groups. Generally, members assigned to TAC, SAC, and PACAF worked on a wider variety of different types of vehicles and equipment. In addition to working on base vehicles, members in these three commands maintained refueling vehicles, materials handling equipment, towing and servicing vehicles, and general purpose vehicles. First-enlistment members in USAFE maintained less base vehicles than members in the other five commands. Additionally, as would be expected, more of the AAC members worked on rollover snowplows, rotary snowplows, and air blast snow sweepers (specific vehicles maintained data can be found in the Training Extract for this report).

TABLE 3

BASE VEHICLES AND EQUIPMENT MAINTAINED BY THIRTY PERCENT OR MORE OF 472X0 FIRST-ENLISTMENT (1-48 MONTHS TAFMS) PERSONNEL

VEHICLE OR EQUIPMENT	PERCENT MEMBERS MAINTAINING (N=172)
FARM TRACTORS	83
FRONT-END LOADERS	83
BACKHOES	79
SELF-PROPELLED GRADERS	79
CRANES, TRUCK MOUNTED	77
DUMP TRUCKS	76
AIR JET VACUUM SWEEPERS	74
TRACTOR DOZERS (CRAWLER)	74
STREET SWEEPERS	71
TOWED SWEEPERS	70
VACUUM SWEEPERS	70
MAGNETIC SWEEPERS	62
GRASS CUTTING EQUIPMENT	61
INDUSTRIAL TRACTORS	59
SELF-PROPELLED ROLLERS	58
WRECKERS	56
ELECTRIC LINEMAN TRUCKS	54
SHOVELS (CRANE, DRAGLINE, BACKHOE, OR CRAWLER MOUNTED)	51
HIGH REACH MAINTENANCE TRUCKS	50
AIR BLAST SNOW SWEEPERS	47
ROLLOVER SNOWPLOWS	47
SELF-PROPELLED ROTARY SWEEPERS	46
STEEL-WHEEL ROLLERS	45
ASPHALT DISTRIBUTORS	44
SELF-PROPELLED LOADERS, CRAWLER MOUNTED	44
WATER DISPENSING TRAILERS	43
CONCRETE MIXERS	42
ROTARY SNOWPLOWS	42
TRACK MOUNTED SHOVELS (CRANES OR BACKHOES)	40
COMPACTORS	38
TELEPHONE MAINTENANCE TRUCKS	38
DRAGLINES, CLAMSHELL	37
WOBBLE WHEEL ROLLERS	37
CRAWLER MOUNTED DITCHERS	36
TOWED ROLLERS	35
ASPHALT SPREADERS-FINISHERS	32

TABLE 4

OTHER VEHICLES AND EQUIPMENT MAINTAINED BY THIRTY PERCENT OR MORE OF 472X0 FIRST-ENLISTMENT (1-48 MONTHS TAFMS) PERSONNEL

GENERAL PURPOSE VEHICLES OR EQUIPMENT	PERCENT MEMBERS MAINTAINING (N=172)
PICK-UP TRUCKS, 4X4	46
TRUCK-TRACTOR TRAILERS	43
PICK-UP TRUCKS, 4X2	41
LOW BED TRAILERS	39
CARGO TRUCKS, 4X2	37
BUSES	36
TRUCK-TRACTORS, 6X4	36
CARGO TRUCKS, 6X6	31
STAFF CARS OR SEDANS	31
STEP-VAN TRUCKS	31
UTILITY TRUCKS, 4X4	31
MATERIALS HANDLING EQUIPMENT	
GASOLINE ENGINE POWERED WHEELED FORKLIFTS	48
WAREHOUSE TRACTORS	37
ELECTRIC POWERED FORKLIFTS	35
TOWING AND SERVICING VEHICLES AND EQUIPMENT	
AIRCRAFT TOWING TRACTORS OR TUGS	45

TABLE 5

TOOLS OR EQUIPMENT USED BY TEN
PERCENT OR MORE OF 472X0 FIRST-ENLISTMENT
(1-48 MONTHS TAFMS) PERSONNEL

TOOLS OR EQUIPMENT	PERCENT MEMBERS USING (N=172)
ELECTRICAL CHARGING SYSTEM TESTERS	59
MANUAL OR HYDRAULIC PRESSES	59
HYDRAULIC TEST GAUGES	45
ENGINE ANALYZERS	29
ELECTRONIC IGNITION TESTERS	22
GAS SHIELD WELDING EQUIPMENT	19
ARMATURE TESTERS	16
EXHAUST EMISSION TESTERS	13
HEADLIGHT TESTERS	12

TABLE 6

PERCENT OF 472X0 FIRST-ENLISTMENT PERSONNEL PERFORMING BASE VEHICLE-SPECIFIC MAINTENANCE TASKS BY MAJCOM GROUPS
(PERCENT MEMBERS PERFORMING)

TASKS		472X0 FIRST-ENLISTMENT PERSONNEL						
		TOTAL FIRST-ENLISTMENT SAMPLE (N=172)	TAC (N=51)	SAC (N=29)	USAFE (N=18)	MAC (N=26)	PACAF (N=10)	AAC (N=15)
Q571	ADJUST CONVEYOR BELTS	13	4	7	0	8	10	60
Q572	ADJUST CRANE BRAKES OR CLUTCHES	45	39	28	39	62	20	60
Q573	ADJUST DIRT SHOES OR DEFLECTORS	25	10	14	39	31	20	53
Q574	ADJUST HOOD CASTER WHEEL ASSEMBLIES	29	18	7	44	39	20	67
Q575	ADJUST HOPPER DOORS	22	8	10	17	39	10	67
Q576	ADJUST LEANING WHEEL GEARBOXES	18	12	3	11	23	20	47
Q577	ADJUST MOLDBOARD SIDE SHIFT MECHANISMS	19	12	3	22	15	20	60
Q578	ADJUST PILE DRIVER COMPONENTS	5	2	0	6	4	10	27
Q579	ADJUST SNOWPLOW ATTACHMENTS	29	14	35	44	31	10	87
Q580	ADJUST SUCTION HOOD DEFLECTORS	28	16	14	44	42	10	67
Q581	ADJUST WOBBLE WHEEL ROLLER COMPONENTS	11	8	0	0	12	10	40
Q582	ALIGN SWEEPER BLOWERS	26	18	17	22	35	20	73
Q583	REBUILD SNOWPLOW ATTACHMENTS	19	10	21	22	4	10	87
Q584	REMOVE OR INSTALL "BELLY" GUARDS	25	16	21	17	23	10	67
Q585	REMOVE OR INSTALL AGITATORS	13	8	3	17	19	20	47
Q586	REMOVE OR INSTALL BULL GEARS OR BULL GEAR PINIONS	12	4	3	6	27	10	40
Q587	REMOVE OR INSTALL CONVEYOR BELTS	13	4	7	6	8	10	60
Q588	REMOVE OR INSTALL CRANE BOOMS	9	6	0	0	23	10	40
Q589	REMOVE OR INSTALL CRANE BRAKES OR CLUTCHES	31	26	14	39	42	10	53
Q590	REMOVE OR INSTALL CRANE FAIRLEAD ASSEMBLIES	9	4	3	11	12	10	33
Q591	REMOVE OR INSTALL DIRT SHOES OR DEFLECTORS	16	8	3	17	27	10	47
Q592	REMOVE OR INSTALL DOZER ACTUATING ARMS	16	6	0	11	27	10	47
Q593	REMOVE OR INSTALL DRIVE SPROCKETS	26	16	10	33	42	20	60

TABLE 6 (CONTINUED)

PERCENT OF 472X0 FIRST-ENLISTMENT PERSONNEL PERFORMING BASE VEHICLE-SPECIFIC MAINTENANCE TASKS BY MAJCOM GROUPS
(PERCENT MEMBERS PERFORMING)

TASKS		472X0 FIRST-ENLISTMENT PERSONNEL						
		TOTAL FIRST-ENLISTMENT SAMPLE (N=172)	TAC (N=51)	SAC (N=29)	USAFE (N=18)	MAC (N=26)	PACAF (N=10)	AAC (N=15)
Q594	REMOVE OR INSTALL GANTRY COMPONENTS	6	4	0	6	8	0	20
Q595	REMOVE OR INSTALL GROUND SHOES	8	4	0	17	12	0	27
Q596	REMOVE OR INSTALL HOIST CLOSING LINE CLUTCHES OR BRAKING SYSTEMS	16	4	3	28	27	10	40
Q597	REMOVE OR INSTALL HOOD CASTER WHEEL ASSEMBLIES	23	16	14	17	39	20	53
Q598	REMOVE OR INSTALL HOOD INTAKE TUBES	16	10	7	28	15	10	47
Q599	REMOVE OR INSTALL LEANING WHEEL GEARBOX COMPONENTS	19	16	3	11	27	10	47
Q600	REMOVE OR INSTALL LEANING WHEEL GEARBOXES	20	18	3	11	27	10	47
Q601	REMOVE OR INSTALL MOLDBOARD SIDE SHIFT MECHANISM COMPONENTS	15	8	3	17	12	10	60
Q602	REMOVE OR INSTALL MOLDBOARDS	17	8	17	17	15	0	60
Q603	REMOVE OR INSTALL OUTRIGGER ASSEMBLIES	22	12	3	17	39	10	47
Q604	REMOVE OR INSTALL PILE DRIVER COMPONENTS	5	4	0	6	0	10	27
Q605	REMOVE OR INSTALL POWER CONTROL SYSTEM SHEAR PINS	15	6	14	6	19	20	40
Q606	REMOVE OR INSTALL SNOWPLOW ATTACHMENTS	29	10	45	44	27	10	93
Q607	REMOVE OR INSTALL SUCTION HOOD DEFLECTORS	23	20	7	22	35	10	60
Q608	REMOVE OR INSTALL SWEEPER BLOWER ASSEMBLIES	33	26	21	28	46	20	73
Q609	REMOVE OR INSTALL TANDEM ROLLER SPRINKLING SYSTEM COMPONENTS	8	10	7	6	0	10	33
Q610	REMOVE OR INSTALL VACUUM SWEEPER COUPLINGS	23	24	10	28	31	10	47
Q611	REMOVE OR INSTALL WOBBLE WHEEL ROLLER COMPONENTS	11	8	0	6	12	10	40

Tools and Equipment Used. Use of tools and equipment was very similar across the six MAJCOM groups. The only difference noted was that substantially more AAC members used armature testers, electrical charging system testers, hydraulic test gauges, and manual or hydraulic presses (specific tools and equipment used data can be found in the Training Extract for this report).

Generally, the differences found between the six MAJCOM first-enlistment groups, in terms of tasks performed, vehicles maintained, and tools or equipment used, were small and did not reflect major differences in the overall job content of first-term personnel assigned to the different MAJCOMs. Some differences noted could have resulted from the small sample sizes of the different first-enlistment MAJCOM groups. In terms of training, any differences in job content between the six MAJCOM groups probably can be handled very easily through local OJT programs.

TRAINING ANALYSIS

Occupational survey data are one of many sources of information which can be used to assist in the development of a training program relevant to the needs of personnel working in their first assignment within a career ladder. Factors which may be used in evaluating training are the percent of first-job (1-24 months TAFMS) or first-enlistment (1-48 months TAFMS) members performing tasks, along with training emphasis and task difficulty ratings (previously explained in the Task Factor Administration section). These factors were used in evaluating the Specialty Training Standards (STSs) and the Plan of Instruction (POI) for the 472X0 career ladder. Technical school personnel from the Chanute Technical Training Center, Chanute Air Force Base, Illinois, matched inventory tasks to appropriate sections of the AFS 472X0 STS, 47271 STS, and POI for Course 3ABR47230. It was this matching upon which comparisons are based. It should be noted that comments and tables presented in this section pertaining to questionable elements (or lack of elements) in the training documents are intended to highlight what appear to be possible problem areas. A complete computer listing reflecting the percent members performing, training emphasis ratings, and task difficulty ratings for each task, along with STS and POI matchings, has been forwarded to the technical school for their use in further detailed reviews of training documents.

Training Emphasis

Generally, the tasks which raters indicated were the most important for first-enlistment training (as indicated by training emphasis ratings) were related to nonvehicle specific functions and dealt with such items as maintaining electrical systems, fuel systems, brake systems, gasoline engines, and wheel bearings (see Table 7 for examples of tasks rated highest in training emphasis). Additionally, as shown in Table 7, many of these nonvehicle specific tasks were performed by more than 30 percent of the first-enlistment 472X0 personnel. The high training emphasis ratings and the percent members performing data would indicate that all are well-suited for some form of common structured training unless other factors override such consideration. Further review of Table 7 reflects that 23 of the 25 tasks listed in this table were matched to the 3ABR47230 POI, indicating they are currently taught in the technical school. Both tasks not matched to the POI involve wheel bearings and have well over 50 percent of the first-term members performing them suggesting that resident course training on these tasks may be appropriate.

Because AFS 472X0 members should be specializing on base vehicles and the related base vehicle-specific tasks, training emphasis ratings for the 41 base vehicle-specific tasks listed in the job inventory were evaluated. As displayed in Table 8, only three of the 41 base vehicle-specific tasks are performed by 30 percent or more first-term members, inferring that these members are not specializing as would be expected. Additionally, all tasks presented within this table are rated average in training emphasis, with only two tasks rated above average in task difficulty. Further review of Table 8 shows that 28 of the 41 base vehicle-specific tasks were matched to the 3ABR47230 POI, indicating they are currently taught in the technical school.

TABLE 7

TASKS RATED HIGHEST IN TRAINING EMPHASIS FOR 472X0 MECHANICS

TASKS		TRAINING EMPHASIS**	TASK DIFFICULTY***	PERCENT MEMBERS PERFORMING	
				FIRST-ENLISTMENT (N=172)	TOTAL 47250 SAMPLE (N=311)
*I271	INTERPRET ELECTRICAL SYSTEM DIAGRAMS OR SCHEMATICS	6.74	5.83	62	62
*I273	ISOLATE CHARGING SYSTEM MALFUNCTIONS	6.72	6.16	76	73
*I266	INSPECT CHARGING SYSTEMS	6.69	4.85	87	84
*I267	INSPECT IGNITION SYSTEMS	6.64	4.75	82	80
*I269	INSPECT STARTING SYSTEMS	6.62	4.54	84	83
*I274	ISOLATE ELECTRONIC IGNITION SYSTEM MALFUNCTIONS	6.59	6.77	38	38
*I272	ISOLATE ALTERNATOR MALFUNCTIONS	6.57	6.17	60	57
*I317	SET IGNITION TIMING	6.55	3.92	80	75
*I279	ISOLATE STARTER SYSTEM MALFUNCTIONS	6.53	4.98	79	74
*H249	TEST CYLINDER COMPRESSION IN GASOLINE ENGINES	6.51	3.92	78	71
*K358	BLEED OR PRIME DIESEL FUEL SYSTEMS	6.50	4.88	74	69
N474	ADJUST WHEEL BEARINGS	6.50	3.90	71	66
*G193	LUBRICATE VEHICLES	6.48	3.37	85	79
*K350	ADJUST CARBURETOR FUEL MIXTURES	6.39	4.61	74	73
*I268	INSPECT LIGHTING SYSTEMS	6.38	3.78	84	84
*I256	ADJUST IGNITION POINTS USING DWELL METERS	6.36	3.83	59	59
*0525	BLEED OR FLUSH BRAKE SYSTEMS	6.36	4.23	83	76
N484	PACK WHEEL BEARINGS	6.34	3.29	90	78
*0523	ADJUST SERVICE BRAKES	6.31	4.23	86	76
*I257	ADJUST IGNITION POINTS USING FEELER GAUGES	6.30	3.82	86	83
*0529	INSPECT HYDRAULIC BRAKE SYSTEM COMPONENTS	6.30	4.61	70	68
*0534	ISOLATE HYDRAULIC BRAKE SYSTEM MALFUNCTIONS	6.30	5.20	66	60
*I283	PERFORM BATTERY LOAD TESTS	6.29	3.78	69	69
*K372	ISOLATE GASOLINE FUEL SYSTEM MALFUNCTIONS	6.29	5.22	70	62
*I276	ISOLATE IGNITION SYSTEM MALFUNCTIONS OTHER THAN ELECTRONIC IGNITION SYSTEMS	6.28	5.54	64	61

* INDICATES TASKS MATCHED TO 3ABR47230 POI
** TRAINING EMPHASIS RATING OF 5.28 OR BETTER IS HIGH
*** TASK DIFFICULTY RATING OF 5.00 IS AVERAGE

TABLE 8

TRAINING EMPHASIS RATINGS FOR BASE VEHICLE-SPECIFIC MAINTENANCE TASKS

TASKS		TRAINING EMPHASIS**	TASK DIFFICULTY***	PERCENT MEMBERS PERFORMING FIRST-ENLISTMENT (N=172)	TOTAL 47250 SAMPL (N=31
*Q572	ADJUST CRANE BRAKES OR CLUTCHES	4.27	5.45	45	42
*Q589	REMOVE OR INSTALL CRANE BRAKES OR CLUTCHES	4.21	6.03	31	28
*Q577	ADJUST MOLDBOARD SIDE SHIFT MECHANISMS	3.65	4.98	19	21
*Q582	ALIGN SWEEPER BLOWERS	3.56	5.14	26	22
*Q608	REMOVE OR INSTALL SWEEPER BLOWER ASSEMBLIES	3.41	5.13	33	28
*Q576	ADJUST LEANING WHEEL GEARBOXES	3.40	5.04	18	20
*Q574	ADJUST HOOD CASTER WHEEL ASSEMBLIES	3.39	4.37	29	25
*Q580	ADJUST SUCTION HOOD DEFLECTORS	3.31	4.29	28	25
*Q596	REMOVE OR INSTALL HOIST CLOSING LINE CLUTCHES OR BRAKING SYSTEMS	3.29	5.81	16	15
*Q593	REMOVE OR INSTALL DRIVE SPROCKETS	3.28	5.92	26	25
Q575	ADJUST HOPPER DOORS	3.24	4.48	22	23
*Q579	ADJUST SNOWPLOW ATTACHMENTS	3.24	5.05	29	26
Q573	ADJUST DIRT SHOES OR DEFLECTORS	3.20	4.50	25	24
*Q599	REMOVE OR INSTALL LEANING WHEEL GEARBOX COMPONENTS	3.19	5.24	19	20
*Q610	REMOVE OR INSTALL VACUUM SWEEPER COUPLINGS	3.16	4.69	23	24
Q603	REMOVE OR INSTALL OUTRIGGER ASSEMBLIES	3.08	5.05	22	20
Q601	REMOVE OR INSTALL MOLDBOARD SIDE SHIFT MECHANISM COMPONENTS	3.07	5.06	15	17
*Q600	REMOVE OR INSTALL LEANING WHEEL GEARBOXES	3.06	5.08	20	20
*Q583	REBUILD SNOWLPLOW ATTACHMENTS	3.02	5.99	19	21
*Q607	REMOVE OR INSTALL SUCTION HOOD DEFLECTORS	3.01	4.09	23	20
*Q597	REMOVE OR INSTALL HOOD CASTER WHEEL ASSEMBLIES	3.00	4.27	23	21
Q592	REMOVE OR INSTALL DOZER ACTUATING ARMS	2.95	4.94	16	16
*Q606	REMOVE OR INSTALL SNOWPLOW ATTACHMENTS	2.95	4.78	29	24
Q571	ADJUST CONVEYOR BELTS	2.91	4.40	13	16
*Q591	REMOVE OR INSTALL DIRT SHOES OR DEFLECTORS	2.83	4.51	16	15
Q585	REMOVE OR INSTALL AGITATORS	2.82	4.78	13	13

* INDICATES TASKS MATCHED TO 3ABR47230 POI
** TRAINING EMPHASIS OF 5.28 OR BETTER IS HIGH
*** TASK DIFFICULY RATING OF 5.00 IS AVERAGE

TABLE 8 (CONTINUED)

TRAINING EMPHASIS RATINGS FOR BASE VEHICLE-SPECIFIC MAINTENANCE TASKS

TASKS		TRAINING EMPHASIS**	TASK DIFFICULTY***	PERCENT MEMBERS PERFORMING FIRST-ENLISTMENT (N=172)	PERCENT MEMBERS PERFORMING TOTAL 47250 SAMPLE (N=311)
*Q605	REMOVE OR INSTALL POWER CONTROL SYSTEM SHEAR PINS	2.82	3.98	15	18
Q602	REMOVE OR INSTALL MOLDBOARDS	2.72	4.11	17	15
*Q598	REMOVE OR INSTALL HOOD INTAKE TUBES	2.72	3.88	16	15
*Q584	REMOVE OR INSTALL "BELLY" GUARDS	2.71	4.20	25	25
*Q587	REMOVE OR INSTALL CONVEYOR BELTS	2.70	5.24	13	13
Q581	ADJUST WOBBLE WHEEL ROLLER COMPONENTS	2.67	4.58	11	13
Q611	REMOVE OR INSTALL WOBBLE WHEEL ROLLER COMPONENTS	2.62	4.66	11	12
*Q590	REMOVE OR INSTALL CRANE FAIRLEAD ASSEMBLIES	2.59	5.56	9	9
*Q588	REMOVE OR INSTALL CRANE BOOMS	2.54	5.97	9	9
Q609	REMOVE OR INSTALL TANDEM ROLLER SPRINKLING SYSTEM COMPONENTS	2.52	4.84	8	10
*Q586	REMOVE OR INSTALL BULL GEARS OR BULL GEAR PINIONS	2.38	6.13	12	13
*Q595	REMOVE OR INSTALL GROUND SHOES	2.31	4.68	12	9
*Q594	REMOVE OR INSTALL GANTRY COMPONENTS	2.30	5.56	6	6
Q578	ADJUST PILE DRIVER COMPONENTS	2.22	5.12	5	5
Q604	REMOVE OR INSTALL PILE DRIVER COMPONENTS	1.94	5.98	1	5

* INDICATES TASKS MATCHED TO 3ABR47230 POI
** TRAINING EMPHASIS RATING OF 5.28 OR BETTER IS HIGH
*** TASK DIFFICULTY RATING OF 5.00 IS AVERAGE

Because these base vehicle-specific maintenance tasks are performed by a low number of first-term members, and are rated only average in training emphasis, resident course training on these tasks may not be appropriate. The only possible exception to this would be the three tasks, highlighted in Table 8, performed by 30 percent or more of first-enlistment members.

3- and 5-Skill Level Specialty Training Standard (STS)

A review of STS 47230/50, dated April 1979, compared STS sections to survey data. Paragraphs containing general information or subject-matter proficiency requirements were not evaluated. The STS provides good overall coverage of most functions performed by base vehicle equipment mechanics. In some cases, the tasks matched to a particular STS item did not have high numbers of first-enlistment or 5-skill level personnel performing them. These STS areas were related to diesel engine fuel system components; steering system components on track vehicles; removing and replacing power control units; servicing hydraulic accumulators; inspecting, troubleshooting, and adjusting boom systems and components; and disassembling, inspecting, reassembling, and adjusting rollover snowplows, rotary snowplows, and scrapers. Table 9 lists tasks performed by 30 percent or less of the 472X0 first-enlistment and 5-skill personnel with STS skill-level or training code levels in need of review. Career field managers and training personnel should review these areas of the STS to reaffirm the appropriateness of code levels assigned for 5-skill level career ladder personnel.

A number of paragraphs in the STS with task performance proficiency codes assigned did not have inventory tasks matched to them. This could mean that an applicable task has not been matched, the element is inappropriately coded as a performance item rather than a knowledge item, or that there are no clearly defined inventory tasks appropriate to that element. Subject-matter specialists and training personnel should review these elements in detail to assure that inclusion in the STS is justified. If that is the case, the possible reason for the unmatched elements discussed above should be pursued and necessary adjustments made. If it is determined that there are not any tasks in the inventory which can be matched to a valid performance element, it is requested that the subject-matter specialists draft the appropriate task statements and forward them to the Occupational Measurement Center for review and use in the next inventory rewrite. Table 10 displays examples of unmatched task performance STS elements. Other elements which should be reviewed include additional subparagraphs within items 9 and 18 through 21.

Tasks not matched to any element of the STS and performed by 30 percent or more of first-enlistment or 5-skill level personnel are displayed in Table 11 (additional tasks not referenced can be found at the end of the STS computer printout in the AFS 472X0 Training Extract). These were reviewed to determine if they were concentrated around a common function. Generally, no particular trends or functional groupings of these tasks were noted. Subject-matter specialists and training personnel should evaluate these tasks to determine if coverage in the STS is justified.

TABLE 9

TASKS PERFORMED BY LESS THAN 30 PERCENT OF 472X0 FIRST-ENLISTMENT AND 5-SKILL LEVEL PERSONNEL
(SUGGESTED FOR STS CODE LEVEL REVIEW)

STS REFERENCE	TASKS	5-SKILL LEVEL STS CODE	TRAINING EMPHASIS	TASK DIFFICULTY	PERCENT MEMBERS PERFORMING	
					FIRST-ENLISTMENT (N=172)	TOTAL 47250 (N=311)
12r	K353 ADJUST FUEL INJECTORS	3c	5.45	6.95	26	25
12r	K351 ADJUST DIESEL ENGINE FUEL LIMITER VALVES	3c	5.31	6.22	23	23
17c(2)	G208 REMOVE OR INSTALL TRACK IDLERS	3c	3.52	6.13	29	25
18b	G207 REMOVE OR INSTALL BOOM CROWD OR RETRACT MECHANISM COMPONENTS	3c	3.26	6.13	19	18
18b	Q605 REMOVE OR INSTALL POWER CONTROL SYSTEM SHEAR PINS	3c	2.82	3.98	15	18
18b	Q590 REMOVE OR INSTALL CRANE FAIRLEAD ASSEMBLIES	3c	2.59	5.56	9	9
19i	J344 SERVICE HYDRAULIC OR PNEUMATIC SYSTEM ACCUMULATORS	3c	4.75	5.56	23	24
20b(1)	Q594 REMOVE OR INSTALL GANTRY COMPONENTS	3c	2.30	5.56	6	6
20d(1)	G178 ADJUST BOOM CROWD OR RETRACT MECHANISM COMPONENTS	3c	3.44	5.72	27	23
21d(1)/21d(2)	Q583 REBUILD SNOWPLOW ATTACHMENTS	3c	3.02	5.99	19	21
21d(1)/21e(1)	Q606 REMOVE OR INSTALL SNOWPLOW ATTACHMENTS	3c	2.95	4.78	29	24
21d(1)/21d(2)	Q595 REMOVE OR INSTALL GROUND SHOES	3c	2.31	4.68	8	9
21d(3)	G211 REMOVE OR INSTALL WINCH ASSEMBLIES	3c	3.84	4.69	24	24
21d(3)	Q601 REMOVE OR INSTALL MOLDBOARD SIDE SHIFT MECHANISM COMPONENTS	3c	3.07	5.06	15	17
21d(3)	Q602 REMOVE OR INSTALL MOLDBOARDS	3c	2.72	4.11	17	15
21e(1)/21e(2)	Q579 ADJUST SNOWPLOW ATTACHMENTS	3c	3.24	5.05	29	26
21e(3)	Q577 ADJUST MOLDBOARD SIDE SHIFT MECHANISMS	3c	3.65	4.98	19	21
21e(4)	Q582 ALIGN SWEEPER BLOWERS	3c	3.56	5.14	26	22
21e(4)	Q574 ADJUST HOOD CASTER WHEEL ASSEMBLIES	3c	3.39	4.37	29	25
21e(4)	Q580 ADJUST SUCTION HOOD DEFLECTORS	3c	3.31	4.29	28	25
21e(4)	Q575 ADJUST HOPPER DOORS	3c	3.24	4.48	22	23
21e(4)	Q573 ADJUST DIRT SHOES OR DEFLECTORS	3c	3.20	4.50	25	24
21e(4)	Q585 REMOVE OR INSTALL AGITATORS	3c	2,82	4.78	13	13

TABLE 10

EXAMPLES OF STS ELEMENTS WITHOUT MATCHING TASKS

STS	ELEMENTS	PROFICIENCY CODES 3-SKILL LEVEL	PROFICIENCY CODES 5-SKILL LEVEL
9b	WINTERIZE VEHICLES	b	3c
12m	SERVICE DIESEL ENGINE AIR SYSTEM COMPONENTS	2b	3c
12o	REASSEMBLE, TEST, AND ADJUST DIESEL ENGINE AIR SYSTEM COMPONENTS	2b	3c
15b	TROUBLESHOOT SYSTEMS (TRACTION AND SUSPENSION SYSTEMS)	2b	3c
15d	TEST AND ADJUST TRACTION SYSTEM	2b	3c
18c(1)	PERFORM OPERATIONAL TEST AND ADJUST BRAKES (PCUs)	2b	3c
18e(1)	INSPECT AND SERVICE SHEAVES (PULLEYS) (PCUs)	2b	3c
19f(2)	PERFORM OPERATIONAL TEST OF PUMPS (HYDRAULIC SYSTEM COMPONENTS)	2b	3c
19g(1)	ADJUST CYLINDERS (HYDRAULIC SYSTEM COMPONENTS)	2b	3c
20e(1)	SERVICE BOOM	2b	3c
21b	PERFORM OPERATIONAL CHECKS ON BASE VEHICLE EQUIPMENT ATTACHMENTS	2b	3c
21f(1)	INSPECT AND SERVICE BOOMS	2b	3c

TABLE 11

TASKS NOT REFERENCED TO 472X0 STS
(30 PERCENT OR MORE PERFORMING)

TASKS		TRAINING EMPHASIS	PERCENT MEMBERS PERFORMING		TASK DIFFICULTY
			FIRST-ENLISTMENT (N=172)	DAFSC 47250 (N=311)	
H249	TEST CYLINDER COMPRESSION IN GASOLINE ENGINES	6.51	78	71	3.92
N484	PACK WHEEL BEARINGS	6.34	90	78	3.29
H229	REMOVE OR INSTALL EXPANSION PLUGS	5.55	49	51	4.02
J331	MANUFACTURE HYDRAULIC OR PNEUMATIC HOSES OR TUBING	5.52	49	52	5.00
K374	MANUFACTURE FUEL LINES OR FITTINGS	5.50	65	65	4.18
H248	TEST CYLINDER COMPRESSION IN DIESEL ENGINES	5.42	34	33	5.50
G206	REMOVE BROKEN STUDS OR CAP SCREWS	5.38	72	60	5.25
J347	SERVICE PNEUMATIC SYSTEM FILTERS OR STRAINERS	5.25	27	31	3.79
K390	REMOVE OR INSTALL INTAKE OR EXHAUST MANIFOLDS	5.17	72	65	4.11
K382	REMOVE OR INSTALL ELECTRIC FUEL PUMPS	5.10	54	54	3.55
I281	MANUFACTURE ELECTRICAL WIRING HARNESSES	5.06	54	55	6.26
G210	REMOVE OR INSTALL V-BELT PULLEYS	4.93	69	63	4.08
C77	CONDUCT VEHICLE LIMITED TECHNICAL INSPECTIONS (LTI)	4.89	44	51	4.56
K389	REMOVE OR INSTALL GASOLINE ENGINE GOVERNORS	4.89	39	33	4.15
J342	REMOVE OR INSTALL PNEUMATIC SYSTEM AIR COMPRESSORS	4.83	33	33	4.42
M460	REMOVE OR INSTALL SPEEDOMETER CABLE ASSEMBLIES	4.62	71	63	3.43
M449	MANUFACTURE TRANSMISSION HOSES OR TUBING	4.48	34	33	4.18
G203	PERFORM SOFT SOLDERING	4.28	43	42	4.56
G209	REMOVE OR INSTALL TRANSMISSION BRAKES	4.19	45	34	4.56
G180	ADJUST TRANSMISSION BRAKES	4.16	51	43	5.49
K393	REMOVE OR INSTALL VACUUM FUEL PUMPS	4.14	34	32	3.94
G197	OPERATE CUTTING TORCHES	3.88	43	41	5.24
P558	DISMOUNT OR MOUNT HEAVY DUTY TIRES	3.73	38	29	4.38
P559	DISMOUNT OR MOUNT LIGHT DUTY TIRES	3.52	35	29	3.46
G196	MECHANICALLY STRAIGHTEN BENT OR TWISTED METAL PARTS	3.11	48	41	5.60
G191	HEAT STRAIGHTEN BENT OR TWISTED METAL PARTS	2.97	37	33	5.96

47271 Specialty Training Standard (STS)

Since the Base Vehicle Equipment Mechanic (AFS 472XO) and Special Vehicle Mechanic (AFS 472X1A/B/C/D) specialties merge at the 7-skill level into AFSC 47271, there is a separate STS for 7-skill level members. Therefore, in addition to reviewing the 3- and 5-skill level STS, the 47271 STS, dated June 1980, was reviewed, comparing STS items to survey data. The 47271 STS provides comprehensive coverage of the significant jobs performed by 7-skill level personnel. Generally, the STS items dealing with supervisory, managerial, and administrative functions were supported by percent members performing data. Besides these supervisory and management tasks, 7-skill level personnel perform a wide variety of technical tasks although many of these technical tasks were performed by a low percentage of members. The portion of the STS related to the technical jobs performed by 47271 personnel provides thorough coverage of the technical tasks performed by these members. Many tasks matched to a particular STS item, however, did not have high numbers of 7-skill level members performing them. These STS areas dealt with such items as final drives, sweeper mechanisms, sliding gear and power shift transmissions, and auxiliary heaters. Table 12 displays example tasks performed by less than 30 percent of DAFSC 47271 members, and the STS item to which these tasks were matched. Other elements with low percent members performing include subparagraphs within items 4, 5, and 8, plus additional subparagraphs in item 11. Because this is a 7-skill level STS, the high proficiency codes may be warranted since 7-skill level members may supervise performance of these items. Career field managers, training personnel, and subject-matter specialists, however, should review these areas of the STS to reaffirm the appropriateness of proficiency code levels assigned for 7-skill level personnel.

Paragraphs in the STS with task performance proficiency codes assigned and not having inventory tasks matched to them included:

9a(1) Apply corrosion control procedures
9a(2) Winterize vehicles
9a(4) Prepare vehicles for shipment

These items may have no matched tasks because the applicable task was overlooked in the matching process, the element is inappropriately coded as a performance item rather than a knowledge item, or there are no clearly defined inventory tasks appropriate to that element. The items should be reviewed in detail by subject-matter specialists and training personnel to determine if inclusion in the STS is justified. (If no tasks in the inventory can be matched to a valid STS performance element, it is requested that subject-matter specialists draft the appropriate task statements and forward them to the Occupational Measurement Center for review and use in the next inventory rewrite.)

TABLE 12

SAMPLE TASKS PERFORMED BY LESS THAN 30 PERCENT OF DAFSC 47271 PERSONNEL
(SUGGESTED FOR STS CODE LEVEL REVIEW)

STS REFERENCE	TASKS		7-SKILL LEVEL STS CODE	TASK DIFFICULTY	PERCENT DAFSC 47271 PERFORMING (N=333)
9a(3)	G204	PREPARE VEHICLES FOR STORAGE	4c	4.27	21
9d	C100	INSPECT VEHICLE MAINTENANCE FOR COMPLIANCE WITH WARRANTY POLICIES	4c	4.84	19
11g(2)	M438	DISASSEMBLE OR ASSEMBLE ACCESSORY DRIVES, AUXILIARY GEAR BOXES, OR AUXILIARY TRANSFERS	4c	6.25	14
11g(2)	N476	DISASSEMBLE OR ASSEMBLE TRANSFER CASES	4c	5.94	14
11g(2)	N518	REMOVE OR INSTALL TRANSFER CASES	4c	4.82	19
11g(2)	M450	REMOVE OR INSTALL ACCESSORY DRIVES, AUXILIARY GEAR BOXES, OR AUXILIARY TRANSFERS	4c	4.68	16
11g(2)	N473	ADJUST TRANSFER CASE LINKAGE OR CONTROLS	4c	4.11	21
11g(2)	M463	SERVICE ACCESSORY DRIVES, AUXILIARY GEAR BOXES, OR AUXILIARY TRANSFERS	4c	3.97	19
11g(7)	M456	REMOVE OR INSTALL FLUID COUPLINGS OR TORQUE CONVERTERS	4c	4.78	13
11g(7)	M443	FLUSH TORQUE CONVERTER UNITS	4c	4.60	8
111	Q589	REMOVE OR INSTALL CRANE BRAKES OR CLUTCHES	4c	6.14	7
111	Q588	REMOVE OR INSTALL CRANE BOOMS	4c	6.02	5
111	Q207	REMOVE OR INSTALL BOOM CROWD OR RETRACT MECHANISM COMPONENTS	4c	5.95	6
111	Q596	REMOVE OR INSTALL HOIST CLOSING LINE CLUTCHES OR BRAKING SYSTEMS	4c	5.94	5
111	Q594	REMOVE OR INSTALL GANTRY COMPONENTS	4c	5.61	3
111	Q572	ADJUST CRANE BRAKES OR CLUTCHES	4c	5.58	11
111	Q590	REMOVE OR INSTALL CRANE FAIRLEAD ASSEMBLIES	4c	5.44	3
11p(3)	U728	ISOLATE SERVICING EQUIPMENT DISPENSING SYSTEM MALFUNCTIONS	4c	6.56	6
11p(3)	U721	DISASSEMBLE OR ASSEMBLE SERVICING EQUIPMENT DISPENSING SYSTEM VALVES	4c	5.91	3
11p(3)	U722	DISASSEMBLE OR ASSEMBLE SERVICING EQUIPMENT TURRET HEADS	4c	5.56	1

TABLE 12 (CONTINUED)

SAMPLE TASKS PERFORMED BY LESS THAN 30 PERCENT OF DAFSC 47271 PERSONNEL
(SUGGESTED FOR STS CODE LEVEL REVIEW)

STS REFERENCE	TASKS		7-SKILL LEVEL STS CODE	TASK DIFFICULTY	PERCENT DAFSC 47271 PERFORMING (N=333)
11p(3)	U719	ADJUST SERVICING EQUIPMENT TURRET HEADS	4c	5.48	1
11p(3)	U736	REMOVE OR INSTALL SERVICING EQUIPMENT DISPENSING SYSTEM VALVES	4c	5.19	4
11p(3)	U739	REMOVE OR INSTALL SERVICING EQUIPMENT TURRET HEADS	4c	4.86	2
11p(3)	U723	DISASSEMBLE OR ASSEMBLE SERVICING EQUIPMENT HOSE REEL COMPONENTS	4c	4.85	4
11p(3)	U738	REMOVE OR INSTALL SERVICING EQUIPMENT HOSE REELS	4c	4.46	3
11p(3)	U737	REMOVE OR INSTALL SERVICING EQUIPMENT DISPENSING SYSTEM NOZZLES	4c	4.43	3
11s(2)	Q583	REBUILD SNOWPLOW ATTACHMENTS	4c	5.95	8
11s(2)	Q579	ADJUST SNOWPLOW ATTACHMENTS	4c	5.31	8
11s(2)	Q606	REMOVE OR INSTALL SNOWPLOW ATTACHMENTS	4c	5.08	9
11s(2)	Q595	REMOVE OR INSTALL GROUND SHOES	4c	4.76	3
11s(2)	Q602	REMOVE OR INSTALL MOLDBOARDS	4c	4.27	5

Finally, tasks displayed in Table 13 were not matched to any STS element and are performed by 10 percent or more of DAFSC 47271 personnel. Generally, most of these tasks were related to performing section maintenance control and administrative functions, performing general maintenance and metal working tasks, and performing supply functions. The tasks listed in Table 13 should be reviewed by subject-matter and training specialists to determine if they should be included during the next STS revision.

Plan of Instruction (POI)

Based on previously mentioned assistance from technical school subject-matter specialists in matching inventory tasks to the 3ABR47230 POI, dated 9 July 1981, a computer product was generated displaying the results of the matching process. Information furnished includes training emphasis (TE) and task difficulty (TD) ratings, as well as percent members performing data for first-job (1-24 months TAFMS) and first-enlistment (1-48 months TAFMS) personnel. Since the course is a Category B basic technical training course, not all members entering the career ladder attend it. The data provided, however, will help training personnel assess if training time is being effectively used for those members attending the course.

Many POI blocks and objectives appear to be supported by survey data, based on percentages of first-term personnel performing tasks or on the high training emphasis ratings. Units in Blocks I, III, IV, and VI do not appear to be supported by the data; Table 14 presents the tasks matched to these units. All tasks identified have less than 30 percent of the first-enlistment population performing, average training emphasis ratings, and, except for one, are rated average or below average in task difficulty. If, due to the nature of the task, structured training is judged necessary, regardless of the low percent members performing, it may be more appropriate to shift training on these tasks from the resident course to OJT.

Another area which should be addressed is that numerous tasks with high training emphasis ratings and high percent members performing are referenced to an objective related to a particular vehicle system and then referenced to objectives pertaining to system components, other systems, and various types of vehicles and equipment. For instance, I269 Inspect Starting Systems, is referenced to Block II, Objective 2c, related to troubleshooting and testing the starting system. This task is referenced again to objectives pertaining to testing and repairing the starter motor (II2d); troubleshooting the engine electrical system (II5a); performing preventive maintenance on a crane (V3b); performing preventive maintenance service and making operational checks on a rollover snowplow (VII4b), a rotary snow blower attachment (VII5b), and a sweeper (VII7b); and performing preventive maintenance services on the Wayne air jet sweeper (VII6b). It is recommended training personnel examine these areas of the POI to assess if training time is being effectively used.

TABLE 13

TASKS NOT REFERENCED TO STS 47271*
(10% OR MORE 47271 PERSONNEL PERFORMING)

TASKS	
G195	MANUFACTURE SPECIAL TOOLS
G183	ARC-WELD MILD STEEL
F165	COORDINATE WITH BASE SUPPLY TO RESOLVE SUPPLY PROBLEMS
G200	OXACETYLENE-WELD SHEET METAL
E141	EDIT COMPUTERIZED MAINTENANCE LISTINGS
G186	BRAZE SHEET METAL
E158	PREPARE REQUESTS FOR DEPOT MAINTENANCE
F176	VERIFY CONTRACT OPERATED AUTOMOTIVE PARTS STORE
G196	MECHANICALLY STRAIGHTEN BENT OR TWISTED METAL PARTS
G191	HEAT STRAIGHTEN BENT OR TWISTED METAL PARTS
G202	PERFORM SILVER SOLDERING
F166	ESTABLISH INVENTORIES OF HIGH TURNOVER ITEMS
G197	OPERATE CUTTING TORCHES
G206	REMOVE BROKEN STUDS OR CAP SCREWS
G214	WELD EXHAUST SYSTEM COMPONENTS
F170	MAINTAIN DEFERRED OR DELAYED PARTS BOARDS OR RECORDS
E145	MAINTAIN WORK CONTROL LOGS OR WORK STATUS BOARDS
F172	POST ENTRIES TO ADJUST STOCK LEVEL FORMS (AF FORM 1996)
E142	INITIATE VEHICLE ACCIDENT OR ABUSE LETTERS
F177	VERIFY DUE-IN-FROM MAINTENANCE (DIFM) DOCUMENT LISTINGS (R-26)
I253	ADJUST DISTRIBUTOR COMPONENTS OTHER THAN IGNITION POINTS
J324	ADJUST PNEUMATIC SYSTEM AIR COMPRESSOR PRESSURE GOVERNORS
V740	ADJUST HINGES OR LOCKING MECHANISMS
E161	PREPARE VEHICLE STATUS REPORTS
P558	DISMOUNT OR MOUNT HEAVY DUTY TIRES
M457	REMOVE OR INSTALL MECHANICAL SHIFTER ASSEMBLY COMPONENTS
G203	PERFORM SOFT SOLDERING
J341	REMOVE OR INSTALL PNEUMATIC MOTORS
J346	SERVICE PNEUMATIC MOTORS
T698	ADJUST FORKLIFT CHAINS
M448	MANUFACTURE SPEEDOMETER CABLES
E157	POST ENTRIES TO WORK ORDER STATUS CARD FORMS (AF FORM 1824)
J347	SERVICE PNEUMATIC SYSTEM FILTERS OR STRAINERS
F169	ISSUE STOCKS OF HIGH VALUE ITEMS
E153	POST ENTRIES TO REFUELING EQUIPMENT HOST INSTALLATION AND HYDROSTATIC TEST DATA RECORD FORMS (AF FORM 1830)
E154	POST ENTRIES TO REFUELING EQUIPMENT INSPECTION DATA RECORD FORMS (AF FORM 1829)
P559	DISMOUNT OR MOUNT LIGHT DUTY TIRES
E152	POST ENTRIES TO RECORD OF CANNIBALIZATION (VEHICLE MAINTENANCE) FORMS (AF FORM 1832)
E151	POST ENTRIES TO PART CARD FORMS (AF FORM 1829)
M460	REMOVE OR INSTALL SPEEDOMETER CABLE ASSEMBLIES

* SUPERVISORY, MANAGERIAL, AND TRAINING TASKS HAVE BEEN OMITTED

TABLE 13 (CONTINUED)

TASKS NOT REFERENCED TO STS 47271*
(10% OR MORE 47271 PERSONNEL PERFORMING)

TASKS	
P568	PLUG TIRES
P565	LEAK TEST TIRES OR TUBES
P570	REMOVE OR INSTALL VALVE STEMS
I316	SERVICE BATTERY CARRIER ASSEMBLIES

* SUPERVISORY, MANAGERIAL, AND TRAINING TASKS HAVE BEEN OMITTED.

TABLE 14

POI BLOCKS REFLECTING PERFORMANCE BY A LOW PERCENTAGE OF FIRST-ENLISTMENT PERSONNEL
(LESS THAN 30 PERCENT PERFORMING)

POI REFERENCE BLOCK - UNIT		TASKS	TRAINING EMPHASIS*	TASK DIFFICULTY**	PERCENT MEMBERS PERFORMING	
					FIRST-JOB (N=61)	FIRST-ENLISTMENT (N=172)
I	4g	E155 POST ENTRIES TO VEHICLE AND EQUIPMENT WORK ORDER FORMS (AF FORM 1823)	4.39	3.44	21	24
I	4g	E149 POST ENTRIES TO MINOR MAINTENANCE WORK ORDER FORMS (AF FORM 1827)	4.31	3.04	21	20
I	4g	E146 POST ENTRIES TO INDIRECT MANHOURS LABOR TIME CARD FORMS (AF FORM 1831)	3.67	3.41	10	15
I	4g	C74 CERTIFY MAINTENANCE DOCUMENTATION FORMS	1.99	4.63	2	6
III	1g	K377 PERFORM EXHAUST SYSTEM SPARK TESTS	4.46	3.88	13	17
IV	1f	J344 SERVICE HYDRAULIC OR PNEUMATIC SYSTEM ACCUMULATORS	4.75	5.56	13	23
VI	4b	G207 REMOVE OR INSTALL BOOM CROWD OR RETREAT MECHANISM COMPONENTS	3.26	6.13	20	19
VI	4b	Q605 REMOVE OR INSTALL POWER CONTROL SYSTEM SHEAR PINS	2.82	3.98	10	15
VI	4b	Q590 REMOVE OR INSTALL CRANE FAIRLEAD ASSEMBLIES	2.59	5.56	5	9

* TRAINING EMPHASIS RATING OF 5.28 OR BETTER IS HIGH
** TASK DIFFICULTY RATING OF 5.00 IS AVERAGE

Finally, some tasks with very high training emphasis ratings and 30 percent or more first-job or first-enlistment personnel performing were not matched to POI blocks (see Table 15). Although the tasks presented in this table have average or below-average task difficulty ratings, combination of high training emphasis ratings and high percent performing indicates that formal training may be required and that resident technical training could be supported.

Subject-matter specialists and training personnel should further evaluate the subject areas and tasks discussed above in an effort to resolve the necessity for training and the most effective method to accomplish it.

TABLE 15

TASKS WITH HIGH TRAINING EMPHASIS NOT REFERENCED TO 3ABR47230 POI BLOCKS
(30 PERCENT OR MORE PERFORMING)

TASKS		TRAINING EMPHASIS*	TASK DIFFICULTY**	PERCENT MEMBERS PERFORMING	
				FIRST-JOB (N=61)	FIRST-ENLISTMENT (N=172)
N474	ADJUST WHEEL BEARINGS	6.50	3.90	75	71
N484	PACK WHEEL BEARINGS	6.34	3.29	93	90
H228	REMOVE OR INSTALL ENGINES	6.10	5.02	80	75
K348	ADJUST AUTOMATIC CHOKES	6.09	4.22	54	58
L404	FLUSH COOLING SYSTEM	5.86	3.71	72	73
H237	REMOVE OR INSTALL TIMING CHAINS, BELTS, GEARS, OR SPROCKETS	5.79	5.59	57	57
0551	REMOVE OR INSTALL SELF-ADJUSTING BRAKE MECHANISMS	5.63	4.43	48	54
0541	REMOVE OR INSTALL BRAKE BOOSTERS, AIR PACKS, OR HYDROVACS	5.59	4.81	46	48
H229	REMOVE OR INSTALL EXPANSION PLUGS	5.55	4.02	43	49
H233	REMOVE OR INSTALL MOTOR MOUNTS	5.54	3.64	59	63
H222	ISOLATE VALVE TRAIN MALFUNCTIONS	5.53	5.18	38	43
J331	MANUFACTURE HYDRAULIC OR PNEUMATIC HOSES OR TUBING	5.52	5.00	41	49
H220	INSPECT MOTOR MOUNTS	5.50	3.40	77	75
K374	MANUFACTURE FUEL LINES OR FITTINGS	5.50	4.18	59	65
0548	REMOVE OR INSTALL DISC BRAKE PADS	5.48	4.28	38	48
H230	REMOVE OR INSTALL FLYWHEEL RING GEARS	5.43	4.79	53	61
H231	REMOVE OR INSTALL FLYWHEELS	5.41	4.29	66	70
K354	ADJUST GASOLINE ENGINE GOVERNORS	5.41	5.13	41	47
G206	REMOVE BROKEN STUDS OR CAP SCREWS	5.38	5.25	72	72
I310	REMOVE OR INSTALL VEHICLE GAUGE PANEL UNITS	5.28	4.21	77	72
L419	REMOVE OR INSTALL COOLING SYSTEM THERMOSTATS	5.28	3.61	69	72

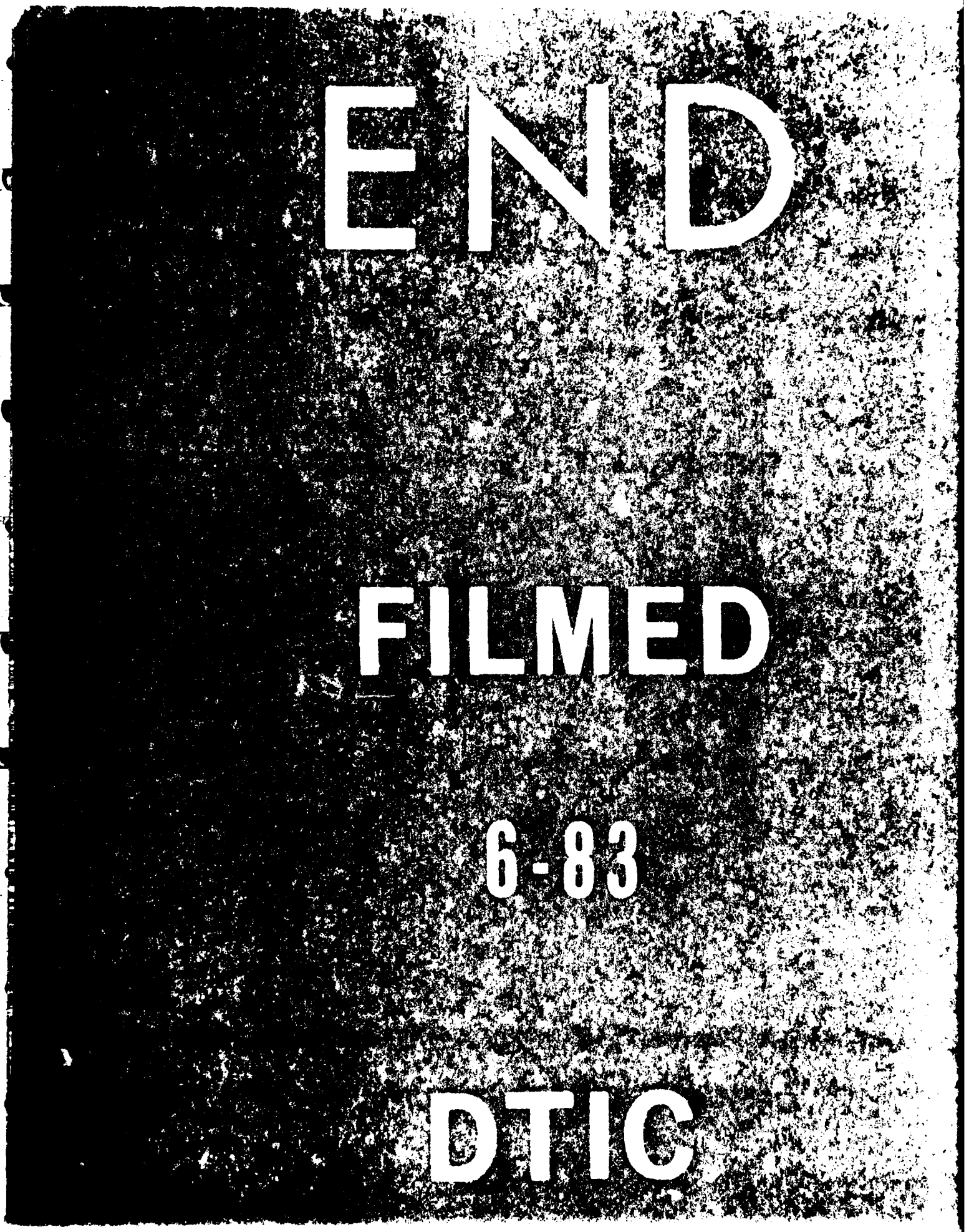
* TRAINING EMPHASIS RATING OF 5.28 OR BETTER IS HIGH
** TASK DIFFICULTY RATING OF 5.00 IS AVERAGE

SUMMARY AND IMPLICATIONS

The base vehicle-specific training emphasis ratings reported in this study were collected to help Air Force decision makers address the training needs of the Base Vehicle Equipment Mechanic specialty. The training emphasis data were compared with occupational information from the August 1982 Base Vehicle Equipment (AFS 472X0), Special Vehicle (AFS 472X1A/B/C/D), General Purpose Vehicle (AFS 472X2), and Vehicle Body Mechanic (AFS 472X3) OSR to review the present training programs.

In determining training requirements, tasks performed and vehicles maintained by first-enlistment personnel need to be carefully considered. For the 472X0 specialty, first-enlistment members performed tasks common to all types of vehicles. Very few first-enlistment members perform tasks specific only to base vehicles and equipment. Members performed the nonvehicle-specific tasks not only on base vehicles but also on a wide variety of other types of vehicles and equipment. In addition, the training emphasis rating on many of the nonvehicle-specific tasks were higher than for the base vehicle-specific tasks. From the data, it would appear that training for base vehicle mechanics should concentrate on various types of systems and system components common to a wide variety of vehicles.

In this report, the current 47230/50 STS, 47271 STS, and POI for Course 3ABR47230 were reviewed. Recommendations were made for possible additions and changes to the training documents. One important issue, however, which should be addressed before training programs and documents are revised is the question of cross-utilization of personnel among the vehicle maintenance specialties. The greatest utilization problem for consistency with career ladder structure concerns AFS 472X0 (Base Vehicle Equipment Mechanic) and 472X1D (Special Vehicle Mechanic - Towing and Servicing Vehicles) members. Because of the way in which these members are utilized, cost-effectiveness of initial specialized training based on the ladder and shred designation is brought into question for AFSs 472X0 and 472X1D. Consolidation of AFS 472X0 and 472X1D into one specialty, or some combination of them, would broaden the training requirements and would perhaps not solve the cost-effectiveness problem. A Utilization and Training workshop on all the vehicle maintenance specialties may be necessary to address these utilization issues and to assess current and projected training needs and programs. At such a workshop, careful consideration should be given to the need to get the right skill and experience for the specialized equipment repair to support operational units. Additionally, the impact on initial and on-the-job training of a reorganization, including the cost-effectiveness of broadening or narrowing the specialty structure, should be addressed.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