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A BENCHMARK OF TRACTOR TRAILER OPERATOR
TRAINING BETWEEN THE UNITED STATES
ARMY'S 37TH TRANSPORTATION COMMAND AND
A SELECTED CIVILIAN INDUSTRY LEADER

THESIS

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AFIT/GLM/LAL/93S-29

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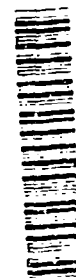
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THESIS

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Master of Science in Logistics Management

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Abstract

The purpose of this research was to determine
differences between the Army's 37th Transportation Command
(TRANSCOM) tractor trailer (T/T) driver training program and
a selected civilian industry leader's training program in
order to identify practices which could improve 37th
TRANSCOM's training program. In order to make this
comparison, the researchers used a benchmarking methodology
to compare T/T training programs of 37th TRANSCOM and Eaton
Roadranger Training Institute. Major findings were
identified in five areas. There were negative gaps in the
four benchmark areas of minimum age requirement, course
content, prior driving experience required of instructors,
and mock-up training aids. One positive gap was identified
in equipment on which students are trained.

The researchers concluded 37th TRANSCOM has a solid
program already, but could benefit from three changes.
Requiring personnel to gain two years of driving experience
before becoming instructors would provide better
instructors, in the researchers' opinion. Additionally, the
researchers concluded 37th TRANSCOM could produce a more
effective T/T operator by including instruction on specific
vehicle operations, and by using mock-up truck systems to
enhance verbal instruction.

A BENCHMARK OF TRACTOR TRAILER OPERATOR TRAINING BETWEEN THE UNITED STATES ARMY'S 37TH TRANSPORTATION COMMAND AND A SELECTED CIVILIAN INDUSTRY LEADER

I. Introduction

General Issue

> Training is the cornerstone of the combat
> readiness our Army must maintain to fulfill its
> strategic roles. Army training is a disciplined
> process to prepare soldiers, leaders and units to
> fight and win. This entails training as we intend
> to fight. It focuses on attaining high standards
> in planning, executing and assessing training at
> all levels and in all types of units. (Vuono,
> 1989:9)

The United States Army's vehicle operator recruits

enlist with little formal vehicle training; hence, they must

acquire new skills from the Army. After basic training,

soldiers who are to become professional drivers are sent to

Advanced Individual Training (AIT) where they are trained in

the basics of their career field. After AIT, they proceed

to their first assignment unprepared to begin driving the

unit's vehicles without further training. For those

soldiers assigned to a unit whose mission is heavily reliant

on tractor trailer (T/T) operations, they must be trained at

the unit level to operate the vehicle before they are

licensed. A vast amount of unit resources are tied up in

this training because the unit must provide instructors,

vehicles, time, and operating funds to mold these new men and women into licensed T/T operators.

As the Army continues to shrink in size and budget as a post-Cold War dividend, fewer personnel and less money are available to accomplish essentially the same mission required of the Army during the Cold War.

> The challenge of the reductions will be to keep the quality of our training and our training products up to standard while using fewer resources. . . . Therefore, what we teach, how we teach it, and where we teach it must be reviewed. (Foss, 1990:56)

If the unit is able to achieve the same level of training while using fewer resources, the unit will have more resources available to accomplish other missions.

Specific Problem

The purpose of this research was to determine differences between the Army's 37th Transportation Command's (TRANSCOM) Motor Vehicle Instructor Program and a selected civilian industry leader's training program, via the benchmarking technique, in order to identify differences which could improve 37th TRANSCOM's training program.

Investigative Questions

1. What areas of tractor trailer operator training should be benchmarked?

2. Which civilian company is an industry leader in the identified benchmark areas?

3. How does the 37th TRANSCOM conduct tractor trailer operator training?

4. How does the civilian industry leader conduct tractor trailer operator training?

5. What performance gaps exist between 37th TRANSCOM's driver training program and the selected industry leader's training program?

Scope

The scope of this research is limited to benchmarking a civilian tractor trailer operator training organization with a mission similar to that of the 37th Transportation Command Drivers' Academy. Although an exact match of their characteristics is not possible due to the different missions (profit versus national defense), the basic goal of training tractor trailer operators is the same.

Four phases of T/T operator training are conducted by 37th TRANSCOM: "Phase I - Drivers Academy; Phase II - Standardization Instructor Driver Program; Phase III - Refresher Driver Training; and Phase IV - Remedial Driver Training" (37th TRANSCOM Reg. 55-108:9-1). Only Phase I and II are included in this study in order to make an accurate comparison of the training conducted by the civilian industry leader. This T/T operator training is limited to training under peacetime conditions. Furthermore, training programs of other Army transportation units, including

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active duty, Guard, and/or Reserves, are not within the scope of the study.

To represent the civilian training industry, Eaton Roadranger Training Institute (ERTI) in Kalamazoo, Michigan, was chosen as the benchmark partner. The Eaton program was chosen as a result of an industry survey of trucking firms which most heavily recruit from formal operator training programs (according to an industry source), and a review of the industry literature for indications of outstanding programs.

In considering training issues, the research addresses the training process. The various aspects of motivation, the learning process, trainee attitude/satisfaction, and group dynamics are beyond the scope of this study, and are left to other studies.

Preview

The following chapter reviews private industry literature on general training issues, a formal training model, civilian industry issues, and benchmarking procedures. Additionally, Department of Defense (DoD) and Army literature focusing on general training, as well as T/T operator training specifically, are examined. After reviewing the relevant published material, chapter three specifies the research methodology used to conduct the study and answer the investigative questions. Chapter four provides a report and analysis of the data gathered.

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Finally, chapter five details the recommendations for
further research, and reports any conclusions.

II. Literature Review

Introduction

In this chapter, the researchers present a review of the literature relevant to the study. First, general training considerations and a specific employee training model are presented, followed by pertinent issues in the civilian trucking industry. Next, they discuss a review of the Army's approach to training, succeeded by a dissection and analysis of the 37th TRANSCOM's driver training program. Lastly, a thorough investigation of the benchmarking technique is presented.

General Training Considerations

Nearly every new employee must undergo some amount of training (Bryan, 1985:5). The basic idea of training is to change behavior through a systematic program of instruction and/or demonstration, with a resultant increase in the employee's value to the organization (Blomberg, Levy, and Anderson, 1988:63; Bass and Vaughan, 1966:4).

> Training comprises bringing together a number of people, presenting them with a set of material to be learned, then releasing them back into the environment from which they came. (Kepner and Tregoe, 1981:213)

The goal of successful training is a relatively permanent behavior change which results in better employee performance in assigned tasks. Two separate precepts are contained within the prior statement. The first, changed

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behavior, is a result of learning, practice, and experience; these components are directly related to the quality of training imparted to the student. On the other hand, performance is a demonstration of learning, which depends on situational factors as well as performer motivation. Consequently, only the first precept falls under the domain of training responsibility; the second depends on the application of learning by the employee and his motivation (Bass and Vaughan, 1966:8; "Employee Training Programs," 1987:69).

Without training, job performance will suffer, and therefore, company performance will not reach its full potential; companies may even lose competitive advantage (Johnson, R., 1976:2-1; "Employee Training Programs," 1987:69). Due to this loss of potential, "the challenge of training employees to carry out the mission of their organizations has achieved a high degree of visibility in recent years" (Head, 1985:1).

The mission of the organization is particularly important, in that, training must be defined, developed, conducted, and evaluated based on the strategic vision and goals of the company. Without focusing on beneficial impacts of training on long term strategy, the investment in personnel can be viewed as a negative in comparison to the multitude of alternative uses for the same capital (Warren, 1979:1; Wexley and Latham, 1991:15; Blomberg, Levy, and Anderson, 1988:64). This visibility of training costs has

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caused management to focus on producing quality products and services (Galagan, 1990:41). However, workers do not enter the work force capable of producing quality products and services. Transforming inexperienced workers into a productive work force requires investment in training ("Employee Training Programs," 1987:69).

In pursuit of this highly trained work force, ". . . American companies spent more than $210 billion [in 1988] on formal and informal training programs" (Lombardo, 1989:60), ranging from schoolhouse training to on-the-job training (OJT). The costs of this training investment can be quantified into four general types: 1) the cost of lost employee time; 2) the preparation cost of training materials for the trainee, and in some cases, the instructor; 3) the transportation cost to send the employee to the location where training is imparted; and 4) the per diem costs of lodging, food, etc. while away (Boylen, 1980:41; "Employee Training Programs," 1987:76).

It is important to get the maximum return possible from the organization's investment, but calculating the return on training investment is not always possible. At this point, cost/benefit analysis is recommended to demonstrate the economic value of training to the organization (Blomberg, Levy, and Anderson, 1988:63-4). "Training should be viewed as an investment in the company's most valuable resource-- people" (Bass and Vaughan, 1966:74).

Although many of the benefits can be tied directly to increased productivity, some intangible benefits, such as increased worker confidence, are difficult to quantify and therefore, difficult to use in justifying the four types of training costs. Despite the difficulty of justification, top management has frequently deemed the intangible areas essential to the company's success. For example, Xerox Corporation spent $125 million over a 3-4 year period training employees, at all levels, on the subject of quality. Although Xerox could not prove the training would be beneficial, it believed in the concept of quality so strongly, the new program was incorporated into its regular training program (Galagan, 1990:43).

To measure training benefits, the effectiveness of training must be measured; but, what are the measures of training's success? Organizations that invest money in training must evaluate how effectively they are spending their dollars (Galagan, 1990:43). One way organizations can tell if they have obtained the most from their training budget is to do a training program evaluation. "Evaluating training is a critical aspect of the training process" (Smith and Merchant, 1990:65) because it allows trainers to determine if the objectives have been met. The objectives for any training program are its measures of success. Achieving those objectives is achieving success (Erickson, 1990:57).

The program evaluation should encompass both short and long term objectives. Any consideration of only short term objectives will facilitate short term thinking, subrogating strategic goals to tactical goals (Erickson, 1990:57). This type of thinking is a prescription for a quick death (Brandt, 1992). In order to prevent a short versus long term mentality, training experts have formulated models of training program development.

Employee Training Model

Faris has developed a model of employee training with eight key steps. He suggests careful consideration of each of these steps will improve the success of the training program. The eight steps of the model are as follows:

Step one: Specifying job and training requirements.

Step two: Developing training objectives.

Step three: Developing and testing the training program.

Step four: Selecting trainees.

Step five: Conducting training.

Step six: Evaluating trainees.

Step seven: Evaluating the training program.

Step eight: Accountability forces (Faris, 1983:85-91). Each of these steps is addressed separately below, integrating the writings of other authors on the phases.

Step One: Specifying Job and Training Requirements.

"First, training needs must be strongly linked to corporate

strategy" (Wexley and Latham, 1991:42). Success of any
training program is related to its ability to impact mission
accomplishment through those receiving the training. A step
in the right direction is to determine long and short term
objectives; specific training goals are then developed to
achieve these objectives (Warren, 1979:53-5; Bass and
Vaughan, 1966:77).

From there, an analysis of the job or job description
is conducted; in the absence of a job description, one is
developed. In either case, all duties performed on the job,
as well as conditions under which performance takes place,
are specified. Specification must be in sufficient detail
to include all necessary knowledge, skills, and abilities
(KSA) required for student understanding and successful
performance. Successful performance must also be defined in
behavioral terms in order to determine the difference
between present behavior and that required to meet the
standard. Inclusion of present performance will allow
assessment of entry level behavior, and provide a reference
point from which training can begin (Wexley and Latham,
1991:45-6, 56; Bryan, 1985:6-7).

Step Two: Developing Training Objectives. From
analysis of the job or job description comes the statement
of training objectives, which should be in behavioral and
operational terms. "What knowledge is the trainee expected
to gain? What skill is he/she expected to develop? What
change in attitude or behaviour is desired?" (Bryan,

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1985:7). Objectives are developed from the KSA inventory, from step one, determined necessary for students to know for job performance. But not all KSA are included in the training objectives. Those KSA which the trainee is expected to know, or which are impractical to teach in a training environment, are excluded from the program (Wexley and Latham, 1991:56-7).

Training objectives are formulated to accomplish three things. First, they describe conditions to be encountered. Next, they designate the appropriate response which the trainee will execute after training is completed. Finally, they specify standards of performance (Faris, 1983:87; Warren, 1979:73).

Step Three: Developing and Testing the Training Program. Contents of the training program are derived from an analysis of present performance versus performance standards. The gap between these two will determine the elements of the training program. An integral part of developing the program is specifying which of the variety of techniques will be used to transfer KSA to trainees. These techniques are generally divided into two categories: on-site and off-site (Faris, 1983:87-8; Warren, 1979:58; Wexley and Latham, 1991:141, 174).

Some of the more common on-site training methods include orientation, OJT, coaching, and computer-based training (Wexley and Latham, 1991:141).

Orientation Training. This training introduces
the employee to co-workers, the job environment, and company
policies and procedures. It is intended to instill
organizational pride in the employee (Bass and Vaughan,
1966:87; Bryan, 1985:5).

OJT. "To many people, . . . OJT simply means
'learning through experience'" (Connor, 1983:1). It is the
most widely used training method due to its practicality and
economy: employees are somewhat productive while learning,
receive immediate performance feedback, and receive positive
transfer of training on the same equipment which they will
be working. But to be effective, OJT must be more than just
having Ol' Joe the supervisor teach the new guy. To meet
organizational objectives and the needs of the individual
being trained, OJT must be systematically planned with
trained instructors imparting the knowledge. When
effectively planned and executed, OJT is one method of
producing a quality-oriented, productive work force.
However, OJT is best when combined with other forms cf
training (Connor, 1983:2, 5; Wexley and Latham, 1991:147;
Bass and Vaughan, 1966:86; Warren, 1979:90).

Coaching. Another on-site training method,
coaching, entails determining what an employee needs to
learn in order to meet job standards, and then developing a
plan to meet those needs. The goal, as in other training,
is to close the gap between required performance and present
performance. The difference between coaching and other

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methods is that coaching achieves this goal through guided performance in the work place. The employee develops personal skills through repeated cycles of performance and periodic review to correct performance (Lovin and Casstevens, 1971:59; Wexley and Latham, 1991:156).

Computer-Based Training. Computer terminals are used interactively to impart a variety of skills and knowledge to trainees. A typical session might include a presentation of information, followed by a series of questions intended to test trainee retention. Correct answers will elicit some positive feedback, while incorrect answers will produce additional training information and another chance to test retention at a later time. Computer-based training's three principal uses are testing, instruction, and student management (Wexley and Latham, 1991:162; Kearsley, 1984:50).

Although there are a variety of other on-site methods, these are the most commonly used techniques for training non-management personnel. The second general category of training techniques is off-site methods, which include lecture, audiovisual techniques, and simulators (Wexley and Latham, 1991:175; Warren, 1979:82).

Lecture. Lecture is characterized by a one-way communication of information from an instructor to a student. Students remain passive during the lecture until a question and answer period. Transmittal of information can take place through videotape as well as live communication.

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Lecture can be a very effective method of imparting knowledge and introducing new ideas. Like OJT, lecture is best when used in conjunction with other training techniques (Wexley and Latham, 1991:176-7; Warren, 1979:82).

Audiovisual Techniques. Touted to be equally as effective as lecture, audiovisual methods can be used for nearly any training and development situation, from orientation to customer service training to mechanic training. These techniques provide a great many advantages over other forms of training: demonstration of procedures, animation, and availability (Wexley and Latham, 1991:179-81; Warren, 1979:96-7).

Simulators. "Simulation attempts to recreate the job environment in controllable form" (Warren, 1979:96). Equipment simulators are built to behave in a manner that closely approximates the real device with hazardous and dangerous realities eliminated. Opportunities for practice are increased, at a greatly reduced cost in many cases, and immediate feedback is possible. The two keys to simulation are control over the environment and reproduction of actual working conditions (Wexley and Latham, 1991:96; Warren, 1979:191).

After determining which teaching method or methods to use in the training program, and the content of the program itself, the next step is to choose employees who will receive training.

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Step Four: Selecting Trainees. Selection procedures
range from mandatory training for all employees to
complicated performance-based appraisal review systems.
Smith and Delahaye suggest looking at five crucial factors
to help in the selection process:

1. The supervisor's attitude: Does the supervisor
know if the employee requires training, and will the
supervisor be supportive both during and after training?

2. The employee's ability: Does the employee have the
ability to handle the rigors of training, and will he
benefit from training?

3. The employee's motivation level: Is the employee
motivated to acquire new knowledge or skills, and then apply
those on the job?

4. The employee's need for training: Is the
employee's job performance lower than expected given his
knowledge and motivation, and will training improve
performance?

5. The employee's opportunity to apply the training:
Is the employee in a job where learned skills or knowledge
can be immediately applied, or will he be moved in the near
future to a job where they can? Negative answers to
questions 2 through 4 will result in no learning taking
place, and a waste of organization funds (Faris, 1983:89;
Smith and Delahaye, 1983:52).

Step Five: Conducting Training. "Training should be
as concrete and job-related as possible . . ." (Faris, 1983:

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90). Blanchard presents a five stage method for conducting training:

1. Telling: How are employees to accomplish the task?

2. Showing: Demonstrating how a task is to be performed.

3. Letting the employee try: Employees do the task based on the previous two steps.

4. Observing the employee: Closely watching employee performance in step 3 for conformance to standards.

5. Praising and redirecting performance: Recognizing good aspects of performance, and providing feedback on incorrectly accomplished facets in order to adjust behavior (Blanchard, 1991:3).

Many effective presentation techniques are presented by Michalak and Yager:

1. Do not start out being apologetic.

2. Be alert to student body signals for interest and boredom.

3. Maintain eye contact.

4. Vary voice speed, pitch, and intensity for emphasis and to avoid monotony.

5. Use notes rather than a script to maintain a naturalness to the presentation.

6. Keep conclusions short (Michalak and Yager, 1979:108-10).

Step Six: Evaluating Trainees. The literature recognizes four areas of evaluation: reaction, learning,

behavior, and results (Michalak and Yager, 1979:137; Faris, 1983:90; Wexley and Latham, 1991:108). Reaction questionnaires are conducted at the conclusion of training, and measure how well trainees liked the program. These can indicate areas for improvement, such as course content, instruction quality, and quality of surroundings. Although not necessarily indicative of program success, reaction questionnaires are important to measure trainees' reactions to the training received before memory distortion occurs (Wexley and Latham, 1991:109, 115; Michalak and Yager, 1979:138).

Learning is usually evaluated by written or performance tests. These tests must be based on the program's training objectives. Tests are intended to measure the change in skills, knowledge, or behavior resulting from the program (Wexley and Latham, 1991:115-6; Michalak and Yager, 1979:138).

Behavior evaluation focuses on changes in employee behavior on the job. Ideally, unobtrusive techniques should be used to assess performance in order to negate testing effects, i.e., the effects created by the employee knowing he is being evaluated (Wexley and Latham, 1991:117; Michalak and Yager, 1979:140).

Results center on meeting the needs which drove the requirement for training. Is the organization better off because of the training program? A successful program achieves not only training goals, but also increases the

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likelihood of meeting the corporate strategy from which
training objectives were formulated (Michalak and Yager,
1979:140).

Step Seven: Evaluating the Training Program. Training
objectives developed in step two are the basis for program
evaluation. Were specific behaviors, promised as a result
of training, developed and used? Successful training meets
these specific objectives. Additionally, strengths and
weaknesses are identified, and a cost/benefit analysis
determines if the program is contributing to the
organization in the way planned. Program validity,
reliability, and usability are examined to ascertain
effectiveness (Warren, 1979:144; Michalak and Yager,
1979:129-31).

Validity.

> Validity refers to the measurement of a cause-and-
> effect relationship. . . . Validity is concerned
> with isolating the training effects so that the
> training programs can be evaluated objectively.
> (Michalak and Yager, 1979:131)

Internal validity is the minimum required of a training
program. Although it is possible to minimize their effects,
the following factors can jeopardize validity:

1. History: Changes in the behavior of employees
occurring for reasons other than training.

2. Maturation: Improvement in behavior due to
longevity on the job.

3. Testing: Changes in behavior because the trainee
knows he is being tested.

4. Methodology: Perceived changes in behavior due to changes in evaluation techniques or personnel.

5. Regression: The tendency for very high and very low scores to converge on the average in subsequent testing of trainees.

6. Trainee selection: Program success related to selection criteria more than the program itself.

7. Mortality: Trainees dropping out of the training program, resulting in skewed data (Michalak and Yager, 1979:131-4; Isaac and Michael, 1981:60-1).

There are three ways to minimize the effects of these threats and increase validity. First, control groups are used to measure the effect of training by comparing changes in the training group to those in a matched group not receiving the training. Both groups are tested at the same time with the same test, and any differences are attributed to one of the seven threats above. Second, placebo training measures changes occurring to a group which did not receive training against changes ensuing in the trained group. Finally, random sampling of trainees is important to ensure the sample is representative of the total population (Michalak and Yager, 1979:131-4).

Reliability. "Reliability is the degree to which a valuative instrument measures accurately or consistently whatever it purports to measure" (Michalak and Yager, 1979:135). Tests which are successful at measuring what they are designed to measure should produce the same results

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each time they are given. Reliability is evaluated using either equivalent forms, split-half forms, or test-retest (Michalak and Yager, 1979:135; Emery and Cooper, 1991:185-7).

Usability. Evaluation methodology must be easy to use. Usability addresses ease of administering, scoring, and interpreting evaluation forms. Money and time spent gathering valuative data should not exceed the problem to be solved. Likewise, comparisons of whether specific goals were achieved should also be easily accomplished (Michalak and Yager, 1979:136-7).

Step Eight: Accountability Forces. The final step is to hold the trainee responsible for applying training received. This can range from supervisor involvement to peer pressure. The training received has to be emphasized on the job, not circumvented by a "this is the way we really do it" attitude. Correct behavior should be recognized and rewarded, while incorrect behavior should be adjusted (Faris, 1983:91; Bryan, 1985:8).

The Faris training model provides organizations a framework and guidance by which they can develop their own training program, or improve any part of an existing training program. The effectiveness of a program depends in large part on how seriously and diligently users pursue accomplishment of the variety of tasks prescribed in the model. For those organizations desiring a high quality product, development of a quality training program requires

a commitment from the organization to thoroughly accomplish each of the many tasks in the model. Having presented a general or generic model for developing a training program, the researchers describe issues in the trucking industry pertinent to training T/T operators.

Trucking Industry Issues

A review of the literature produced four primary concerns relevant to tractor trailer operator training: operator shortages, driver retention, accident safety, and the commercial driver's license (CDL).

Operator Shortages. Since the late 1980's, the hottest issue in the trucking industry literature has been ". . . a rather unexpected shortage of qualified over-the-road drivers . . . in the motor carrier industry" (Southern, Rakowski, and Godwin, 1989:42). Furthermore, the shortage is expected to continue into the mid-to-late 1990's, posing a serious problem in the motor carrier industry. The shortage of drivers is expected to be between 20 to 30 percent, with an estimated 425,000 to 500,000 additional jobs available in the industry from 1985 to 1995 (Moore, 1989:118; Abercrombie, 1985:518; Southern, Rakowski, and Godwin, 1989:47; Moskal, 1989:26; Lemay and Taylor, 1988:15).

There are a variety of reasons for this driver deficit. Jerold Heiken and others blame pay and working conditions. The trucking industry believes its efforts to weed out

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dangerous and unqualified operators has contributed as well. Moskal credits tighter licensing standards, stressful lifestyle, a new drug-testing program mandated by the Department of Transportation (DOT), as well as low pay. A final important factor is the high amount of time spent away from home (Heiken, 1988:12; Mele, 1989b:46; Southern, Rakowski, and Godwin, 1989:42; Moskal, 1989:26; Mele, 1989a:106).

What can trucking firms do to counter this shortage problem? Southern, Rakowski, and Godwin (SRG) surveyed industry trucking firms to discover the status of recruitment efforts. They found personnel directors rated pay, equipment condition, and amount of time spent away from home to be the most important of the variety of incentives offered, yet only the first two incentives were stressed in attempting to recruit new drivers. The reason a lessened amount of time away from home is not stressed may be a result of the fact that a great deal of time is spent away from home while driving for many companies, naturally causing a lessened emphasis on this incentive (Southern, Rakowski, and Godwin, 1989:42-47).

Considering methods of recruitment, SRG found companies heavily favored newspapers and word-of-mouth, but noted relatively low use of radio, which they believed to be a good medium due to its cost and reach. Under driver qualification and testing, SRG found more than 93 percent of companies surveyed have a minimum driving experience

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requirement, with 83 percent requiring one to three years driving experience. Furthermore, over two-thirds had formal training programs for driver hires. Southern, Rakowski, and Godwin came to the conclusion that important benefits were consistently stressed, but recruitment could be improved by more use of highway billboards and truck stop bulletin boards; no further mention was made of using radio (Southern, Rakowski, and Godwin, 1989:42-47).

What strategies are companies actually pursuing to alleviate the operator shortage? Organizations are using one or a combination of the following tactics to reduce the gap between demand and supply. Pay is being increased. Comfort features are being added to older equipment and specified in new equipment purchases. Schedules are being modified to get drivers home more frequently and more regularly. Benefit packages are being enhanced with such items as mileage or monetary guarantees, and incentive bonuses for safety and recruitment efforts of the operators. Finally, firms are establishing in-house training programs and/or linking themselves with certain driving schools as a ready, reliable source of new recruits (Mele, 1989a:106-11; Moore, 1989:120-5).

Several trucking companies have developed their own training to alleviate the shortfall and exert greater control over program content and quality. For example, Texas' Central Freight Lines conducts it own T/T training with an individualized approach. Management would rather

teach a beginner the way they believe best than to have to break bad habits of someone with two to three years driving experience with another trucking company. Trainees are taught the essentials of driving and paperwork preparation through classroom and over-the-road instruction time. Students are frequently tested on their knowledge and performance, and periodic refresher training is conducted (Moore, 1989:124-5). Other examples include J.B. Hunt Transport Inc. and deBoer Transportation Inc., who each generated an in-house program in order to blunt the effects of driver scarcity and avoid sidetracking their expansion plans (Mele, 1989a:106).

Con-way Western Express (CWX), a subsidiary of Consolidated Freightways Inc., was so successful in establishing and administering their own training program that it opened two more schools within three years. CWX schools build their drivers from the ground up, starting with company philosophy and history, then moving into the very basics of T/T operations, and finally, culminating in execution of state-approved road testing to qualify trainees for heavy-duty licenses. The company feels graduates are truly committed to CWX after completion (Mele, 1989b:52).

As an alternative to in-house programs, a great number of trucking firms have started working with driver-training schools to meet each firm's training criteria. Werner Enterprises started working with schools in 1988 to prevent driver shortages within their firm and to continue their

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expansion plans. Graduates coming to work for Werner from these schools have been trained under a Werner-approved curriculum (Mele, 1989a:111). Another company, Swift Transportation, works in close concert with Rio Salado Community College to train new recruits. In addition to supplying program instructors, Swift participated in program creation to ensure the program met its needs. The result has been that graduates stay with the company twice as long as graduates from other schools. In addition, association with the college gives the program credibility (Moore, 1989:120). Other organizations linking themselves with established programs include Trans-Western Express Ltd., Averritt Express Inc., and Poole Truck Line Inc. (Mele, 1989b:46; Mele, 1989a:107, 110).

Research conducted by Abercrombie on T/T driver schools identified 140 such specialized institutions, with nearly half located in vocational-technical and community colleges, and the remainder in proprietary schools. Instructional areas included trucking industry structure, driving techniques, minor maintenance, and paperwork preparation. Although all schools specified virtually the same list of instruction topics, length and depth of coverage varied greatly across programs. Entrance requirements were generally the same between state-sponsored and private schools; however, one exception was the requirement of a high school diploma or General Educational Development certificate. Public schools required one of these documents

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for entrance, but private schools only require the ability to read, write, and understand English, in addition to evidence of completion of eight years of education (Abercrombie, 1985:519-28).

Students receive a completion certificate upon graduation from the driver training school. Trucking firms generally accept the certificate of written examination and certificate of road test issued by the school as evidence of course completion; however, possession of these documents is no guarantee of employment with firms which require some experience, as demonstrated in the survey by Southern, Rakowski, and Godwin above (Abercrombie, 1985:519-28).

Abercrombie also described the federal proposal to provide a standardized minimum curriculum which truck driver training schools should follow. The standardized curriculum idea started in 1976 with the DOT proposal of a six-week, 240-hour curriculum designed for drivers already possessing a normal motor vehicle operator's license. Each student was to spend a minimum of 900 miles behind the wheel of a T/T and 1800 miles as an observer. The proposal also stated requirements for professional driver instructors, and for graduation. In 1984, the DOT issued minimum training requirements for T/T operators, covering topics from basic operation to advanced operating practices to non-vehicle activities. Program length was increased to eight weeks, i.e., 320 hours of instruction (Abercrombie, 1985:529-33).

What happened to those proposed 1984 standards? In
1985, the DOT released the "'Proposed Minimum Standards for
Training Tractor-Trailer Drivers' (Office of Motor Carriers,
1985)" (*Criteria for Voluntary Certification*, 1989:1).
Although the proposed standards "for the most part . . .
[have] been gathering dust at the agency" (Moore, 1989:117),
an organization in Elk Grove, California, the Professional
Truck Driver Institute of America (PTDIA), developed an
accreditation program to certify T/T operator training
courses and curricula. This program was adapted from the
1985 DOT guidance (*Criteria for Voluntary Certification*,
1989:1).

"PTDIA is a nonprofit organization whose primary
purpose is to advance truck driver training, proficiency,
safety, and professionalism" (Moore, 1989:118). It is an
industry-sponsored organization committed to certifying
truck driver training courses. Certification procedures are
voluntary and must be requested by the program desiring
certification. The organization's certification criteria
are stringent, and program evaluation rigorous (*Criteria for
Voluntary Certification*, 1989:1).

"Certification is . . . the evaluation of a course of
study measured against industry-accepted standards [in] . .
. regard to scope, content, and intensity of instruction"
(*Criteria for Voluntary Certification*, 1989:1). Programs
which meet or exceed those standards and submit to the
organization's evaluation and certification procedures are

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accorded certification. Certification procedures begin with a voluntary request for evaluation from an applicant, followed by verification of eligibility and readiness of the course to be certified. Next, PTDIA performs an on-site evaluation. The process is culminated with a review and decision by the PTDIA Certification Board (*Criteria for Voluntary Certification*, 1989:Foreword,1).

The PTDIA criteria handbook describes the certification process which training organizations must complete to become certified. The book details 14 areas of the process. The first section, voluntary certification policies and procedures, is aimed at fostering course improvement and increased use of training programs, as well as judging program quality. This section describes eligibility requirements, and provides an in-depth explanation of the certification process, including recertification procedures. Section two lists criteria for certification; all programs which meet or exceed these criteria are given certification. Those failing to meet the criteria can re-apply at a later date. Criteria include such standards as:

1. Amount of student time spent on behind-the-wheel training.

2. Education and training requirements of trainers.

3. Instructor-student ratio.

4. Equipment-student ratio.

5. Conditions and environment for behind-the-wheel training.

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6. Minimum training time requirements of the PTDIA.

7. Minimum passing scores required of the program in each area to qualify for certification (*Criteria for Voluntary Certification*, 1989:11-12; "Document A Revision", 1992:1-7).

The handbook's next two sections address criteria for evaluating each course, curriculum, and hours of instruction. The PTDIA provides a lengthy list and description of criteria by which it evaluates courses. These detailed criteria cover the following five areas:

1. Program administration.

2. Curriculum organization.

3. Instructors.

4. Training equipment.

5. Classroom instruction.

Evaluation standards for minimum requirements for hours of instruction are outlined for each of the areas of classroom, range, lab, and over-the-road training (*Criteria for Voluntary Certification*, 1989:13-22).

Documents C1 through C4, from the handbook, provide specific requirements which must be met or exceeded for the curriculum, hours of instruction, time waivers, and instructor qualifications. Document C1 specifies a general curriculum outline covering basic and advanced operations, vehicle maintenance, safety practices, and non-vehicular activities. Required and optional hours of instruction for subareas within each curriculum area are given in Document

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C2, while time waivers, in lieu of substitute training techniques, are described in Document C3. Document C4 outlines the rigorous qualifications required of instructor personnel (*Criteria for Voluntary Certification*, 1989:23-40).

The last six sections of the handbook provide guidance for on-site inspection procedures and standards, as well as operation of the certification board on applicant requests and subsequent evaluation findings. Document D1 provides a checklist of areas for self-inspection by the applicant to assess readiness for an on-site evaluation; Document D2 delineates the standards used by the PTDIA inspection team to evaluate a program during an on-site visit. Document E facilitates scheduling and reference of the on-site inspection via a checklist format. Documents F through F2 describe the PTDIA Certification Board, its members, brief selection procedures for members, and actions taken to certify, re-certify, and reconsider applications and evaluations (*Criteria for Voluntary Certification*, 1989:41-85).

After students graduate from other than in-house training programs, they are usually subjected to apprenticeship training by their new employer. This training includes company orientation, and pairing of inexperienced drivers with seasoned professionals for a period of up to 12 months of over-the-road experience. The intent is to improve the novice's skills and foster

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increased retention through controlling the environment the new recruit faces in the first several months. Results indicate both objectives are satisfied to a large degree (Mele, 1989a:106-9; Moore, 1989:124-5).

Two other items of note were encountered in the literature review. Two training programs are offered by manufacturers of tractor components with an eye toward increasing their business. Eaton Corporation and Cummins Engine Company established training schools to help relieve the industry operator shortage and provide customer service. Although the long term intent of the two programs is to increase sales by infusing drivers loyal to the manufacturer's products into the industry, the Cummins-based program is giving indications of successful operation through higher-than-average retention rates after trainee graduation and placement. While a high percentage of graduates from other schools normally quit within the first six months after placement, 80 percent of Cummins graduates are still on the job after six months. As a relatively new entry in the training arena, Eaton has yet to evaluate their success at the six month point. Yet, Eaton understands its standards need to be high because poor quality training would reflect negatively on the corporation (Moskal, 1989:26).

Once an organization finds qualified T/T operators to fill its shortages, it must find ways to retain those

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operators. Retaining drivers is an organization's next
problem.

Driver Retention. Retention is closely tied to the
driver shortage issue. During a driver shortage, it is
easier for operators to change jobs, resulting in exits for
the smallest problems. Turnover rates in the industry range
from insignificant for some firms to over 300 percent
annually for others, with the yearly average approximately
100 percent. Although some segments of the trucking
industry encounter retention problems more than others,
individual driver training costs ranging from $1000 to $4000
cost the industry and many firms dearly. The causes of
turnover are similar to those of the shortage problem,
including quality of life issues, the desire to spend more
time at home, other industries offering better pay and
benefit packages, as well as the ability to easily move
between jobs (Mele, 1989a:106-7; Lemay and Taylor, 1988:15;
Moore, 1989:117, 128).

The most serious problem with retention appears to lie
with new recruits.

> The most serious retention problem is usually
> among new drivers recruited from training schools
> who quickly find out that being a truck driver
> doesn't quite measure up to the romantic life
> depicted in movies and songs. (Mele, 1989b:48)

With over half of survey respondents indicating often
or frequent turnover problems (Southern, Rakowski, and
Godwin, 1989:43), trucking companies are not standing still
in their fight to improve retention. Firms are actively

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pursuing a variety of approaches to enhance the driver's working conditions. Increased pay seems to be the first item improved, in accordance with SRG's research into most important incentive aspects (Southern, Rakowski, and Godwin, 1989:43). Likewise, the second and third most important incentives, equipment condition and time spent away from home, have been improved by many organizations. Many are implementing a team concept, attempting to establish an emotional attachment with drivers through such methods as reducing dispatcher-to-driver ratios, providing educational cassettes to listen to while on the road, and recognizing outstanding operators. Benefits packages are being enriched by including more benefits in areas like profit sharing, stock options, health insurance, productivity and safety bonuses, and retirement. Safety programs are stressed. Additionally, organizations are using stringent hiring standards to find drivers with increased maturity and stable attitudes. Finally, drivers are being treated as professionals (Mele, 1989a:107-111; Mele, 1989b:46-52;). As Paul D. Amen, president of Trans-Western Express Ltd., stated, "'Everyone here in the office had to realize that our job was to support the revenue-producing position on the team[--]the driver'" (Mele, 1989b:46).

Accident Safety. "We all know that a truck can be a lethal weapon if it is not properly handled. We must do all possible to have top-notch professional drivers as well as the best in equipment" (Zanneville, 1990:34). Abercrombie

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reported 85 percent of T/T drivers involved in accidents had
no formal commercial driver training. Safety training can
improve this performance, and be enhanced by inclusion in
T/T operator training programs. Schools should do all they
can to promote, organize, and teach quality safety courses.
These courses should emphasize specific factors which
characterize safe operation in all aspects of driving,
especially T/T operations. Students should be continuously
exposed to this training through demonstration, description,
and discussion until the ideas have become so ingrained that
operator usage of these precepts is as natural as any other
driving skill (Abercrombie, 1985:518, 535).

Accidents in the trucking industry involving over-the-
road vehicles cost fleets five percent of their gross
revenues in 1971. Although the average direct cost of an
accident is only about $1700, total cost tops $8000 when
worker's compensation, increased premiums, etc. are
included. Numbers like these give companies substantial
reason to increase safety emphasis. Additional reasons
include prevention of injury, fatality, and property damage.
These sobering figures and an increased emphasis by the
public on safety brought this issue to the forefront for
commercial carriers (Abercrombie, 1983:15; Bradley, 1992:65;
Mele, 1991:60).

What has been the trend in accidents? From 1975-1979,
before the passage of the Motor Carrier Act of 1980 which
deregulated the motor carrier industry, accidents, injuries,

and fatalities were increasing at an alarming rate. Motor carriers experienced a 46.4 percent increase in accidents, a 37.6 percent growth in fatalities, and a 21.8 percent rise in injuries during this five year period (Abercrombie, 1983:16).

Alexander conducted research on accident experience after deregulation. He found the number of ICC-authorized truck drivers doubled from 1980 to 1986, and hypothesized that trucking accidents would increase due to more traffic congestion and inexperienced T/T operators. Although truckers drove more total miles, his findings suggested the accident rate remained the same as it was before deregulation, while fatalities and injuries decreased. He concluded that deregulation had produced unexpected benefits in this area. This research on fatalities was corroborated by Coyle, Bardi, and Cavinato in their text on transportation, in which they reported a 5.8 percent reduction from 1980 to 1986 (Coyle, Bardi, and Cavinato, 1990:17, 320; Alexander, 1992:29, 32, 36).

What is in a safety program? Dennis LaLiberty, vice-president of marketing for Wheels (a major fleet management company) suggests the inclusion of five major areas:

1. A corporate safety policy emphasizing the importance of safety.

2. Safety training.

3. Vehicles designed and equipped with safety in mind, including safety kits and vehicle safety features.

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4. Driver safety performance evaluation focusing on records checks and reviews, and accident investigations.

5. Constantly reinforcing the safety policy of the company (Bradley, 1992:64).

Commercial Driver's License. With the intent of improving motor carrier safety, the Commercial Motor Vehicle Safety Act of 1986 required truck and bus drivers already licensed to obtain a CDL by 1 April 1992. To acquire this new license, truck and bus drivers are required to pass written tests covering knowledge of general areas of commercial vehicle operation, as well as specific written tests on types of cargo hauled and/or vehicles operated by the individual. Additionally, operators must pass driving tests, unless they meet certain requirements for waiver. All tests must meet minimum federal standards and are taken in the driver's home state. The CDL replaced all other commercial licenses, and it is illegal to possess more than one CDL. Additionally, once an operator has been issued a CDL, he is licensed to drive vehicles in all lower classifications (Krolin, 1990:94, 96; "The CDL," 1990:37; Moore, 1989:117; Golubski, 1992:21).

The legislation established a national CDL clearinghouse and information system to facilitate an electronic exchange of information on driving records and licensing histories. The purpose of the clearinghouse is to provide more accurate details on driving records, to prevent multiple licenses, to make it harder for a driver to hide a

poor driving record, and to prevent circumventing moving violation punishment through drivers holding more than one license. Each state is responsible for designing a comprehensive system to tie into the national system, but the act allows states latitude to set many program parameters. Such parameters include licensing fees, length of time a CDL remains valid, and penalty lengths for drivers maintaining more than one CDL. By October 1993, all states not meeting the April 1992 deadline for issuing new licenses will have five percent of their federal highway construction funds withheld by the DOT, and 10 percent withheld if still not in compliance by October 1994 (Krolin, 1990:94, 96, 132).

Failure rates of drivers taking the CDL exam have been a bone of contention for some states. California experienced a 35 percent failure rate initially; however, this rate has subsequently decreased to 10 percent. The American Association of Motor Vehicle Administrators sets the average failure rate between 3 and 15 percent nationwide (Krolin, 1990:94, 96, 132).

Due to their frequency of occurrence in the literature, the researchers selected these four issues as those most pressing to trucking firms, with respect to the research area. The driver shortage and retention problems will continue until conditions causing the problems are corrected and qualified drivers are available to overcome the shortage. Accident safety will also continue to be a

concern for a variety of reasons (cost, injuries, etc.). As
for the CDL, the passage of time will determine the impact
of this requirement on the trucking industry.

The civilian industry has expended a lot of time and
money determining the best methods to use to train its
workforce and solve its manning problems. Similarly, the
Army has developed a training system to meet its needs.
Next, the researchers present the Army's approach to
training.

Army Training

Just as the civilian industry has training
requirements, the Army must teach its new "employees" how to
perform the job expected of them. The importance the Army
places on training is evident in the Army's training mission
statement: "Our top priority is training" (FM 25-100,
1990:1-1). The following Army manuals are devoted to the
subject of training.

> FM 25-100, Training The Force, establishes the
> Army's current philosophy on "how to train" to
> fight. FM 25-101, Battle Focused Training
> Management at Battalion Level and Lower, provides
> battle focus for battalion and company commanders
> to establish training programs designed to attain,
> sustain, and enforce high standards of combat
> readiness. (CAS^3 E308/2, 1990:errata sheet)

The foundation of the Army's training program is the
unit's wartime mission. The mission drives the selection of
mission essential tasks, which in turn, drive a planning,
execution, and assessment cycle (FM 25-101, 1990:1-11).

Due to the volume of tasks involved, the Army recognizes its units "cannot achieve and sustain proficiency on all possible soldier, leader, and collective tasks" (FM 25-101, 1990:1-10). The importance of prioritizing is stated by General Bruce C. Clarke,

> Do the essential things first. Each commander must determine wisely what is essential and assign responsibilities for accomplishment. Nonessentials should not take up time required for the essentials. (FM 25-101, 1990:2-1)

To assist commanders in determining what the "essential things" are, the Army uses a process called battle focus. Under the battle focus concept,

> Commanders must selectively identify and train on those tasks that accomplish the unit's critical wartime mission. The [unit's] METL [Mission Essential Task List] serves as the focal point on which commanders plan, execute, and assess training. . . . [T]he METL is an unconstrained statement of tasks required to accomplish wartime missions. (FM 25-101, 1990:1-10, 2-2)

Training management is a model of the battle focus approach that uses feedback to assist leaders in focusing peacetime training on wartime missions (FM 25-101, 1990:1-11). The training management cycle depicts how planning, execution, and assessment work together (Figure 1 in Appendix A).

In FM 25-101, the Army espouses nine principles of training that provide direction for leaders:

- Train as combined arms and services team.
- Train as you fight.
- Use appropriate doctrine.
- Use performance-oriented training.
- Train to challenge.
- Train to sustain proficiency.

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- Train using multi-echelon techniques.
- Train to maintain.
- Make commanders the primary trainers. (FM 25-101, 1990:1-3 through 1-9)

The Army establishes the importance of commanders in the training process by appointing them as primarily responsible for training their respective units (FM 25-101, 1990:1-1). Army doctrine dictates the effort necessary for commanders to fulfill their training obligation:

1. [Provide] base training on wartime mission requirements.
2. Identify applicable Army standards.
3. Assess current levels of proficiency.
4. Provide the required resources.
5. Develop and execute training plans that result in proficient individuals, leaders, and units.
(FM 25-100, 1990:1-6, 1-7)

The Army training system consists of three elements: the training base, training in units, and training support. These elements work together to provide a system for achieving and maintaining a combat ready force (CAS^3 E308/2, 1990:2).

The Training Base. The training base refers to the basic knowledge required for future job performance based on rank. This training takes place at numerous locations. At the training base,

Soldiers start their careers, receive their first orientations to the Army, and learn basic skills. . . . [T]hey return to the training base throughout their careers to learn more advanced skills and leadership techniques. The training base includes--service schools, training centers, US Army Reserve Forces schools, Army National Guard academies, colleges and universities, commercial firms, and Major Army command installation and unit schools. (CAS^3 E308/2, 1990:2)

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The training base is divided into five categories to serve the individualized needs of enlisted soldiers, noncommissioned officers, commissioned officers, warrant officers, as well as the specialized needs of the Army regardless of rank (CAS[3] E308/2, 1990:2-8). These categories are addressed separately below.

Enlisted Soldiers. For an enlisted soldier, training begins when he first enters the Army and attends initial entry training. Initial entry training (IET) is conducted as either "(1) basic training (BT) followed by advanced individual training (AIT), or (2) one station unit training (OSUT)" (CAS[3] E308/2, 1990:2). The goal of IET is

> to produce a committed, disciplined, and
> physically fit soldier, who is knowledgeable and
> competent in selected basic and MOS-related
> [Military Occupational Skill-related] skill level
> 1 tasks. Graduates of IET have received basic
> job-related training but have neither job
> experience nor proficiency in all skill level 1
> requirements. (CAS[3] E308/2, 1990:2)

Pay grades E-1 through E-4 must be proficient in skill level 1 requirements. As soldiers progress through the ranks, they are required to master successively higher skill levels (CAS[3] E308/2, 1990:3).

Noncommissioned Officers. Noncommissioned officer training consists of a series of schools mandated by the Noncommissioned Officer Education System (NCOES). "Throughout their careers, at appropriate points, they [noncommissioned officers] return to the training base for leadership and job-related training" (CAS[3] E308/2, 1990:3).

This noncommissioned officer training consists of a series of resident courses that prepare noncommissioned officers to perform the duties of their current and/or next higher rank (CAS^3 E308/2, 1990:3).

Commissioned Officers. Officers are educated through a series of schools and courses that are usually linked to their rank and time of service. Their base training is conducted at resident schools and begins with pre-commissioning training at the officer's source of commission (i.e., U.S. Military Academy, Reserve Officer Training Corps, Officer Candidate School, or National Guard Academies). After commissioning, the officer attends training schools to give him the required skills to perform in assignments required of his rank and branch (CAS^3 E308/2, 1990:5).

Warrant Officers. Warrant officers work in specialized fields and require unique skills and knowledge to be able to perform their technical jobs. The training base for warrant officers consists of schools in which time of attendance, duration, and courses taught are tailored to the specific warrant officer specialty (CAS^3 E308/2, 1990:7).

Specialized training. The Army's training base also includes "schools and courses to develop skills and knowledge needed for specific assignments. Examples include Ranger School, Airborne School, . . . etc." (CAS^3 E308/2, 1990:8).

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Training in Units. The skills learned in the training base are perishable, and therefore, need to be reinforced in the units. This training involves individual training, collective training, and multi-echelon training (CAS³ E308/2, 1990:8-15).

Individual Training. Individual training is divided into two categories: soldier training and leader training. Soldier training is conducted by first-line supervisors and focuses on critical tasks each soldier must be able to perform at each skill level. These critical tasks are identified in the appropriate soldier's manuals based on rank and MOS (CAS³ E308/2, 1990:9).

For leaders, the aim of individual training is different. Unit commanders ensure unit-conducted officer training sustains those skills taught in base training, and develops those skills not yet taught but deemed necessary. Noncommissioned officer training is the responsibility of the unit's command sergeant major and is designed to ensure first-line supervisors are proficient in their duties (CAS³ E308/2, 1990:10).

Collective Training. Collective training builds on individual training by integrating the individual and his skills with those of the remainder of the team (FM 25-101, 1990:2-9). Collective training consists of the following methods:

1. Training drills. Training drills are standardized methods of turning a task into an instinctively

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and spontaneously performed drill. Drills reinforce individual proficiency and prepare soldiers to be able to accomplish complex collective tasks (CAS[3] E308/2, 1990:11).

2. Weapon system proficiency. Weapon system proficiency is a collective task that involves taking individual marksmanship skills and transferring them to the efficient operation of a weapon system. Additionally, team mobility and survivability skills are stressed (CAS[3] E308/2, 1990:12).

3. Unit proficiency. This training involves continual practice to reinforce basic individual and crew tasks. It is conducted under as realistic conditions as possible, usually in field environments (CAS[3] E308/2, 1990:12).

4. Systems proficiency. Systems proficiency refers to a unit's ability to manage systems required for mission accomplishment. "Systems training requires that unit commanders employ all the available systems to ARTEP [Army Training and Evaluation Program] standards" (CAS[3] E308/2, 1990:12). ARTEP standards are specific training objectives for tasks the unit must perform to execute its mission. The ARTEP uses a task-conditions-standard format to specify training objectives. This format states the task, the conditions under which the task is to be performed, the standards to which the task must be performed, and training support requirements (CAS[3] E308/2, 1990:16). In addition to his own unit's performance, a

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commander is also concerned with how well supporting units perform their mission (CAS[3] E308/2, 1990:12).

Multi-echelon Training. "Multi-echelon training is the simultaneous training of more than one echelon on different tasks" (FM 25-101, 1990:1-6). The goal is to concurrently train units, leaders, and soldiers at each echelon of the organization (CAS[3] E308/2, 1990:14).

Training support. The third component of the Army Training System, training support, consists of two major types of training resources: general resources and training support materials. General resources are not unique to training and include facilities, land, fuel, ammunition, funds, personnel, time, and equipment. Training support materials include publications (field manuals, soldier's guides, trainer's guides, etc.), training and audiovisual materials, the Army Correspondence Course Program, and mobile training teams (teams, provided by service schools, which travel to installations to provide training) (CAS[3] E308/2, 1990:16-23).

In the recent past, there has been sufficient funding available to support superior training for both soldiers and leaders. However, the end of the Cold War and the economic recession in the United States have caused lawmakers to reduce the Defense budget significantly. This reduction in funding from a high of 11.9 percent of the gross national product in 1953 to the current 4.7 percent will have an

adverse impact on Army funding as a whole and training support in particular (Cheney, 1991:3).

Army Driver Training. Army training is a large program which encompasses numerous schools teaching diverse skills to soldiers of different ranks and job skills. This thesis deals with one aspect of Army training: driver training, and in particular, T/T driver training.

Army driver training is important because "before a truck unit can effectively perform its mission, its personnel must possess the skill and knowledge to safely operate . . . motor vehicles" (FM 55-30, 1989:9-5). General Norman Schwarzkopf, US Central Command Commander-in-Chief during Operation Desert Shield/Storm (ODS), recognized the importance of vehicle operators and their machines to the success of ODS: "I think guys like me need to be reminded every now and then that trucks can be just as important as tanks" (Mitchell, 1991:42).

The Army's professional drivers constitute only 10 percent of Army soldiers who drive vehicles. Professional drivers are full-time operators of a variety of transport vehicles. These drivers are designated MOS 88M and receive specialized driver training. The majority of soldiers who drive (90 percent) are trained for a specific piece of equipment once they arrive at their unit (i.e., tank drivers, armored personnel carrier drivers, two and one-half ton truck drivers, etc.). This training takes anywhere from two days to two weeks (Johnson, N., 1991:26).

Until recently, soldiers trained as professional drivers (MOS 88M) attended an eight-week AIT at either Fort Dix, New Jersey or Fort Leonard Wood, Missouri. During this eight-week course, they received familiarization training on many vehicles. However, the vehicle they would drive at their first unit was not emphasized. Furthermore, the soldier might not train on it at all (Johnson, N., 1991:26; Morrow and Frazier, 1993:6).

The Army driver training program is undergoing changes due to force reductions, budget cuts, and changes in technology. One area identified for change is the training soldiers receive at AIT. Currently, there is only one base which provides Motor Transport Operator AIT for drivers: Fort Leonard Wood. The course was changed from an eight week familiarization course to a five week, four day qualification course where instructors train soldiers on the vehicles they will drive at their first unit of assignment (Morrow and Frazier, 1993:4-6).

The standard is for drivers to graduate from AIT with a Class B Army Commercial Drivers License (ACDL). "The ACDL Program parallels the commercial drivers license (CDL) effort, recently implemented in all 50 states" (Morrow and Frazier, 1993:6). Students receive a Class B license after passing written and hands-on tests on the 5-ton cargo truck. Drivers may be awarded a Class A license if they pass the ACDL tests on the M915 and M872 T/T combination. Due to time constraints, unless a soldier has previous T/T driving

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experience, the goal of receiving a Class A license while at AIT is unrealistic. The ACDL tests include "general knowledge, air brakes, vehicle inspection, basic control skills, and a road test" (Morrow and Frazier, 1993:6). Since a Class A license is required for T/T operation, and the standard is for students to earn a Class B license, the need exists for further T/T training at the soldier's first duty assignment (Morrow and Frazier, 1993:4-6).

Another problem has been the lack of driver training standardization throughout the Army. Each unit designed driver training based on unit needs and this resulted in different standards for licensing. Support for standardized training consists of the following:

- Developing distributed training packages.

- Increasing 88M Basic Noncommissioned Officer Course (BNCOC) by one week to strengthen training management competencies.

- Fielding driver training devices.

- Emplacing a regional infrastructure to ensure quality and standardization [Regional Driver Standardization Offices] (RDSO). (Johnson, N., 1991:26)

Distributed training packages (DTP) provide a standardized, MOS immaterial, method of training wheeled-vehicle operators. These packages contain all the teaching aids needed to conduct standardized training (Johnson, N., 1991:26).

To support DTP, BNCOC is extended by one week. During this week, noncommissioned officers are exposed to DTPs with

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a focus on the role of the noncommissioned officer as the unit driver trainer. The concept is to establish unit "master driver" who is responsible for all unit driver training needs (Johnson, N., 1991:27).

Training simulators will be used to improve unit-conducted training. Simulators allow trainers to safely conduct hazardous, situational driver training (Johnson, N., 1991:26).

To ensure these new driver training strategies are implemented fully and produce quality drivers, RDSOs will located throughout the continental U.S. and overseas. These offices will provide mobile training teams to assist units, and also provide a two-week train-the-trainer course (Johnson, N., 1991:26).

Historically, the lack of complete initial entry driver training put the burden of ensuring that a driver was adequately trained on the soldier's first unit. Unit personnel had to tailor their training program to meet unit's needs.

37th TRANSCOM. The 37th TRANSCOM is an Army transportation command in Germany, subordinate to the 21st Theater Army Area Command, with the mission of providing military highway line-haul service in Germany, the Netherlands, Belgium, and Luxembourg (37th TRANSCOM Reg. 55-108, 1991:1-3). The 37th TRANSCOM has been, and is still, affected by the draw-down of Army units in Germany. Units have been re-organized and disbanded throughout Germany.

Prior to the start of the draw down, 37th TRANSCOM consisted of four subordinate transportation battalions: three U.S. Army battalions and one German Civilian Support Center (37th TRANSCOM Reg. 55-108, 1991:1-3). The U.S. battalions operated a combined total of 12 medium T/T companies, one heavy equipment transporter company, six trailer transfer points, and three drivers' academies in support of the TRANSCOM's mission (37th TRANSCOM Reg. 55-108, 1991:1-5). Currently, only two of the three U.S. battalions are operating drivers' academies (Messinger, 1993).

37th TRANSCOM Driver Training Program. Since initial entry driver training did not provide the T/T training required, 37th TRANSCOM designed their own T/T driver training program. Each drivers' academy starts training a new class every month. With class sizes varying from 15 to 30 students, each academy graduates approximately 300 students a year (Pace, 1993). The 37th TRANSCOM driver training program is divided into four phases:

Phase I: Drivers' Academy

Phase II: Standardization Instructor Driver Program

Phase III: Refresher Driver Training

Phase IV: Remedial Driver Training

Phase I training consists of two weeks of classroom instruction and one week of hands-on range instruction. The academy's noncommissioned officers are responsible for teaching the 53 hours of required classes listed in 37th

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TRANSCOM's Letter of Instruction: Army Motor Vehicle Instructor Program and 40 hours of range instruction.

The days are long for the students at the drivers' academy. In addition to T/T driver training, the academy cadre are responsible for ensuring the students receive physical training and uniform inspections. For example, a typical day consists of the following:

Time	Activity/Subject
0545 - 0700	Physical training
0700 - 0845	Personal hygiene, breakfast
0845 - 0900	Personal appearance inspection
0900 - 1000	M210 Vans
1000 - 1200	Commitment procedures
1200 - 1300	Lunch
1300 - 1400	The Army Maintenance Management System
1400 - 1600	Breakdown and remain-over-night procedures
1600 - 1700	Retest on German law and road signs (53d

Transportation Battalion Training Schedule, undated).

The researchers segregated the 53 required hours of instruction into the following six general categories:

1. Documentation training: consists of accident reports, Transportation Control and Movement Documents (TCMDs), and truck manifests.

2. Hazardous/sensitive cargo training: consists of petroleum, oils, and lubricants (POL) handling, hazardous cargo instruction, and classified and sensitive cargo procedures.

3. Specific vehicle operation training: consists of training on the M915/M915A1 Tractor, the M911 Heavy Equipment Transporter (for the 377th Transportation Company only), M210 Mercedes Van, the M1008/M1009 three quarter ton

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truck, and various trailers (M871, M872, M747, S209, M129A3, M969, and M139).

    4. European driving and international traffic law training.

    5. Maintenance training: consists of training in The Army Maintenance Management System (TAMMS) and preventive maintenance checks and services (PMCS).

    6. Commitment training: consists of training on breakdown and overnight procedures, map reading, blocking and bracing, and vehicle security (37th TRANSCOM Reg. 55-108, 1991:Appendix D).

    The second phase, Standardization Instructor Driver Program, is taught by Standardization Instruction Drivers (SIDs). The SIDs are senior drivers within each truck company who have demonstrated their competency as T/T drivers. Phase II consists of hands-on training drivers receive on T/Ts (Pace, 1993).

    Phases III and IV are post-licensing phases. Phase III deals with required periodic refresher training while Phase IV specifies required training for drivers involved in accidents. As indicated in Chapter I, the scope of this study includes only the pre-licensing training conducted by the academies (Phases I and II). Table 1 summarizes the drivers' academy phases of instruction.

    Army training is a critical ingredient in the Army vision: "America's Army is a Total Force, trained and ready to fight; serving the Nation at home and abroad . . . a

TABLE 1

37TH TRANSCOM DRIVERS' ACADEMY PHASES

PHASE	ACTIVITY	RESPONSIBLE FOR CONDUCTING TRAINING
I	Drivers' Academy	Battalion Drivers' Academy
II	Standardization Instructor Driver	Company SIDs
III	Refresher Driver Training	Battalion Drivers' Academy
IV	Remedial Driver Training	Battalion Drivers' Academy

(37th TRANSCOM Reg. 55-108, 1991:9-1)

strategic force capable of decisive victory" (Shannon and Sullivan, 1993:2). However, how does a unit know if its training program is a good as it can be? Next, the researchers focus on a solution to this problem: the benchmarking process.

Benchmarking

The benchmarking technique is a relatively new method of improving business operations. "In its simplest form, benchmarking is a process companies use to methodically track down business practices and approaches judged to be among the best in the world" (Altany, 1991:12). Looking outside the organization is the best way to find the best practices employed by other companies, whether in the same

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industry or not, or even outside the United States (Martin, 1991:7).

The purpose of benchmarking is to analyze and identify areas within the organization that can benefit from improved methods, "identify the leading company's secrets to success in that function" (Altany, 1991:12), and implement those secrets which have been adapted to meet the situation in the receiving company (Balm, 1992:6). The bottom line is process improvement (Whiting, 1991:130).

Industry experts credit Xerox Corporation with developing benchmarking in 1979 as a management tool to control manufacturing costs as a way to regain market share against Japanese competitors (Camp, 1989:6; Geber, 1990:38). Due to their incredible success in controlling costs, Xerox adopted the technique company-wide as an avenue to improve company performance. Xerox continued to refine the process, demonstrating continued success, and established itself as the premier benchmarking expert (Biesada, 1991:29).

Other companies, facing similar competitive and product quality pressures, observed Xerox's success with the technique and began to use the process to address their problems. As more organizations experienced benchmarking success, the technique gained increased credibility and validity, and new converts (Bemowski, 1991:19; Biesada, 1991:29; Whiting, 1991:128).

The rising significance of benchmarking as an organizational improvement tool in the 1990's was clearly conveyed by Darel Hull and Edward Tracy of AT&T:

> It is becoming clear that during the 1990's more and more companies are going to be employing Benchmarking as a significant tool for continuous improvement and for strategic planning. The continuing growth and emphasis in America on implementing Quality Processes into the corporate management and non-management community further ensures the growth of Benchmarking. For the logistics industry and perhaps for all American management functions, it is a leading edge management technique for the 1990's. (Hull and Tracy, 1990:195)

The fact that many respected companies (AT&T, ALCOA, GTE, Motorola, IBM) used and adopted benchmarking as a quality improvement tool helped to further its credibility (Bemowski, 1991:24; Biesada, 1991:30). Additionally, the Malcolm Baldridge Award played a part in the increasing popularity; one requirement for winning the award is use of the benchmarking technique (Whiting, 1991:128; Biesada, 1991:29).

Although there are many different benchmarking processes, ranging from Spendolini's generic 5 step method (Spendolini, 1992:47) to AT&T's 12 step process (Bemowski, 1991:20-1), the recognized benchmarking expert is Robert Camp. Camp is the manager of benchmarking competency at Xerox Corporation and he started their program (Biesada, 1991:28). He wrote the first application book on benchmarking. In his book, Camp lists the 10 steps of the Xerox benchmarking process:

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1. Identify what is to be benchmarked.
2. Identify comparative companies.
3. Determine data collection method and collect data.
4. Determine current performance "gap".
5. Project future performance levels.
6. Communicate benchmark findings and gain acceptance.
7. Establish functional goals.
8. Develop action plans.
9. Implement specific actions and monitor progress.
10. Recalibrate benchmarks. (Camp, 1991:17)

Camp's Ten-Step Benchmarking Process.

Step One: Identify What is to be Benchmarked.
The key ingredient in the first step is determining the product of the operation under consideration. Any benchmarking effort begins with understanding the company's internal practices and processes. To determine those processes and practices, Camp recommends starting with the mission statement, the highest level of corporate vision, to ascertain general objectives, and working down through the tactical objectives to specific operational areas to be benchmarked. Furthermore, he recommends documenting the steps which comprise these practices and processes, and the critical measurements used (Camp, 1989:41-3, 49). Since sufficient funds are rarely available to address all areas, functional areas needing help should be prioritized, and processes benefitting most from improvement addressed first (McReynolds and Fern, 1992:21).

Step Two: Identify Comparative Companies. There are four types of benchmarking operations that can be used to identify comparative companies as possible benchmark partners:

1. Internal Operations: comparing similar functions within the same organization, and implementing the best practices throughout the company (McReynolds and Fern, 1992:20). Internal operations should not be ignored. For an organization to compare itself against an industry leader, the former must understand its own operations first (Day, 1992:70). Additionally, achieving the internal benchmark is an important first step to benchmarking outside the organization (Geber, 1990:40). Due to availability of information and cooperation of partners, this is a relatively easy form of the technique to execute (Camp, 1989:161-162). Although internal benchmarking is easy to execute, "comparison with outsiders . . . can highlight the best industry practices and promote their adoption" (Tucker, Zivan, and Camp, 1987:8).

2. External Direct Product Competitors: comparing a function of an organization against that of a direct competitor. This type of benchmarking is difficult to do because of competitive pressures to hide sensitive business information from others, and because of legal considerations related to "antitrust issues" (Spendolini, 1992:93). To circumvent these problems, an outside consultant can be used to collect data and ensure confidentiality of information sensitive to the industry leader (Camp, 1989:55-62). While competitors are loathe to share information on line functions, many industries freely

share information on staff functions, like order entry or other routine operations (Biesada, 1991:30).

3. Functional Benchmarking: comparing an organization's function against that of another company not in the same industry. Functional benchmarking constitutes the majority of benchmarking being accomplished (Foster, 1992:32). Choosing the partner requires matching similar customer needs between the two organizations (Camp, 1989:63-65). Results are not transferred exactly piece-by-piece into the organization's operations, but tailored to fit company and industry differences (McReynolds and Fern, 1992:21). By benchmarking outside their own industry, corporations gain access to cutting-edge knowledge. The problem is convincing firms there are companies with comparable operations outside their industry (Biesada, 1991:31).

4. Generic Benchmarking: not a pure benchmarking technique unto itself, serendipitous processes discovered during the benchmark process are applied to areas not slated for investigation (Camp, 1989:65).

After determining which form of benchmarking to use, the organization must choose the industry leader. This is generally considered one of the hardest steps in benchmarking, and is more art than science (Geber, 1990:42). Several avenues can be pursued to find best-in-class companies. Search business publications for companies frequently appearing in quality-related articles. Search

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trade publications for companies with innovative practices. Ask consultants or customers for industry leaders in the functional areas of interest. Perhaps the best source of potential best practices is trade associations and industry conferences (Geber, 1990:42; Foster, 1992:36).

Step Three: Determine Data Collection Method and Collect Data. "Preparing for the site visit is the key to making sure that you get what you need from the benchmarked company" (Geber, 1990:42). Before gathering data on the benchmark partner's operation, an organization must first analyze and fully understand its own operation. This internal analysis can be accomplished in three ways: 1) product analysis, which entails breaking down the industry leader's product; 2) internal investigation of company sources and experts, i.e., salesmen, functional directors; and 3) relevant data from existing studies conducted by others, best accomplished through a network situation (Camp, 1989:79-88).

Next, a thorough literature review of public domain information about the partner is conducted to ensure the benchmark team is fully informed. Sources of information include periodicals, company reports, conference proceedings, trade associations, and newspapers. This review is important to ensure time is not wasted getting this same information during the site visit. From this review, researchers formulate their plan of attack,

detailing the amounts and types of information to be gathered during the site visit (Camp, 1989:83-4).

Then a team meets with their counterparts from the industry leader to investigate areas being benchmarked (Freedman, 1992:49). Ideally, this team should include employees and managers directly affected by any changes (Martin, 1991:7). By forming a team affected by the changes, employees buy-in to changes much more readily because of their involvement in determining those changes either directly or vicariously through team members (Whiting, 1991:132). Data is gathered by using a questionnaire, developed from the review of internal and publicly available sources, as a checklist or guideline to help guide discussions (Camp, 1989:73-99). Additionally, supporting documents are examined, and operations are observed. "The visitation team must obtain an understanding of why and how the target's operations work so efficiently" (McReynolds and Fern, 1992:24) in order that they may learn from those operations (McReynolds and Fern, 1992:23-4).

The team should look for process knowledge which drives the operational efficiency. Similarities and differences are noted in order to help in comparative analysis in step four, and implementation in step nine. The data collected must then be transformed into meaningful information which will help the organization do the comparative analysis (Freedman, 1992:49). Quantifying the data facilitates the

goal-setting stage in step seven (Geber, 1990:44; Patrick, 1992:72; Thompson, 1992:50).

Step four: Determine Current Performance Gap.
After data has been collected, it is compared to internal processes. This comparison will reveal one of three types of competitive or performance gaps, defined as the difference between the practices of the partners. A negative gap exists when a company's practice is inferior to the best practice of the industry leader; findings of this type should lead to changes in processes which will lead to superior performance. A positive gap exists when a company's practices are superior to the benchmark partner's; these should be recognized and rewarded. Finally, operations are considered to be at parity when no significant difference exists between practices; although not negative, superior performance is not built on this type of finding. Gap analysis is intended to be an objective analysis of the size and reasons for the gaps (Camp, 1989:121-4).

> The basic analysis process is one based on the analysis and understanding of differences; it is a comparative analysis. The basic steps include tabulating both descriptive and numeric data, analyzing the data for understanding and rationale, determining the benchmark, determining the gap by comparison to internal operations data, evaluating and describing the reasons for the existence of the gap, and evaluating the factors that contribute to the best practices' existence. (Camp, 1989:122)

Two methods for identifying the gap are analytic analysis and market superiority. Superior performance

through analytic analysis is easily determined if data are accurate and adequate. Superior performance of internal operations through market superiority is harder to determine because the demand and retail price for the internal operations of the industry leader is normally a hypothetical proposal; a company's internal operations are not a commodity offered for sale (Camp, 1989:125-8).

Once a gap has been identified, there are two ways to analyze that gap: qualitative and quantitative analysis. Qualitative analysis should be accomplished first because quantitative analysis is the result of the former. Qualitative analysis is a semantic description of the difference with an explanation of the opportunity available to the firm for closing the gap. It separates the difference into the lowest meaningful elements, i.e., that level at which the elements can be quantified in order to affect productivity and efficiency. Quantitative analysis transforms these elements into measurements which can be used to compare operations against the industry leader. These metrics should also show what operations and processes will look like if the best practices are implemented in the organization (Camp, 1989:128-141). Qualitative analysis

> . . . describes the opportunity for closing the gap, . . . [whereas] quantitative description determines the size of the gap and measures the opportunity [for closing the gap]. (Camp, 1989:135)

Step Five: Project Future Performance Levels.
The gap or difference between the two firms' operations

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indicates how much performance can be improved. It is important to estimate the gap expected at a future point in order to set goals for closing, and eventually surpassing, that difference. To make an accurate estimate, the organization must be aware of future trends expected in the industry. Since the industry and competitors are continually striving for process improvement, the current difference is compared to the difference expected in the future (Camp, 1989:151-158; Geber, 1990:40, 44).

One way to estimate the gap expected in coming years is through use of a statistical Z chart, which graphically portrays the magnitude of the gap now and in the future based on probability. By analyzing the Z chart, differences in operations can be distinguished as tactical or strategic, resulting in the appropriate level of management attention focused on eliminating the disparity (Camp, 1989:155-6).

Taking their current position relative to the industry's predicted position, the company forecasts their future performance level needed to close the gap with the industry leader as well as the associated time frame, based on adoption of the identified innovative practices. After the analysis is completed, the most significant benchmarks are identified; these benchmarks will have the greatest impact on productivity and efficiency (Camp, 1989:151-158; Geber, 1990:40, 44).

Step Six: Communicate Benchmark Findings and Gain Acceptance. After top management has accepted and approved

the findings, strategies are formulated to improve process performance to achieve significant benchmarks identified in the previous step. The strategies are then incorporated into strategic goals and plans. These new plans must also be communicated to functional managers and employees to gain acceptance of the findings. Functional managers must be convinced of the worthiness of findings in order to gain their commitment to obtaining the new targets. Lower level employees must be persuaded the new plan or way of doing things is better for the organization, and better for them. Without this commitment, plan implementation will be far more difficult, and possibly fail (Camp, 1989:163-168; Geber, 1990:40).

In essence, communication of benchmark findings is a continuation of the process of involving affected personnel in the early stages of the benchmark process. Due to their active participation in developing the various stages of the study, they are more likely to accept the findings. Communication of findings is accomplished through a variety of media, including company newsletters, meetings, one-on-one conversations, and company reviews (Camp, 1989:163-168; Geber, 1990:40).

Step Seven: Establish Functional Goals. Using strategic goals established in step six, the organization must formulate new functional area goals as well. The process starts with an evaluation of current goals. A good place to start is the annual objectives and budget. What

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performance measures are incorporated in the objectives and budget? Since company direction is undergoing changes based on significant performance differences (as measured against the industry leader), old performance measures may have to be redesigned to assess progress toward the new targets. Caution should be exercised in making wholesale changes; rather, a range around the new goal may serve better (Camp, 1989:175-179).

After redesigning performance metrics, new functional goals are drafted based on benchmark statements. These statements not only describe the gap, but also how processes need to be changed to close the gap (Camp, 1989:175).

Camp suggests the best approach to making benchmark statements understandable and acceptable is to turn the statements into operating principles, which are not specific to any function or person. By making them non-specific, individuals will not become defensive. Instead, application of the principles is targeted to specific areas. Open discussion is encouraged so all organizational levels understand the new operating principles. These operating principles provide the road map to how and when the organization will achieve the desired improvement (Camp, 1989:175-179).

Step Eight: Develop Action Plans. Action plans are developed from the operating principles. These plans detail specific actions to be taken to achieve superior performance. The plan should specify who is responsible for

each action and how much authority he has to make the action work (Martin, 1991:23).

Camp specifies two considerations in developing action plans: task and behavioral considerations. Task considerations specify who, what, when, where, and how:

1. Task specification: the task to be performed is completely described for the individual responsible for accomplishing it.

2. Task sequencing: a step-by-step description of the task in a logical order.

3. Resource needs assignment: determination of the resources needed to accomplish the task.

4. Schedule establishment: length of time to complete the task.

5. Responsibilities assessment: responsibility and accountability is specified; shared responsibility should be stated.

6. Expected results: expected output from implementation of the new process is defined.

7. Monitoring: measurement of expected output as a result of the new process.

Action plans are organized; they show resources, responsibility, best practice to be achieved, and time frame involved in eliminating the gap. Behavioral considerations address personnel issues associated with gaining support for changes (Camp, 1989:185-189; Geber, 1990:44). "While the benchmark practices themselves may have been accepted, the

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acid test of acceptance is shown in the willingness to change" (Camp, 1989:191).

Step Nine: Implement Specific Actions and Monitor Progress. Implementing specific actions and monitoring progress is the next step. At this level, the best practices are incorporated into the operation. Since most action plans will be inserted in the organization in line operations, line managers are the logical choice for implementation if they understand the plans and responsibilities. In most cases, potential for successful implementation is increased when responsibility is invested in the manager responsible for the operation under improvement; however, this case assumes line manager support and commitment (Camp, 1989:207).

A second implementation strategy is the use of a project team. Project teams perform well when large, complex changes are taking place which cut across functional lines. Line managers are then free to concentrate on making required changes to make their daily operations successful (Camp, 1989:207-8).

Another tactic is to use a "process czar," (Camp, 1989:208) which works well when several processes are involved and understood by few personnel. The czar is empowered to see that action plans are implemented and processes improved. He accepts responsibility for the processes (Camp, 1989:208-9). Finally, performance teams (quality circles) can be used to implement changes. The

direct involvement of team members in the operations being changed is generally considered beneficial to improving processes (Camp, 1989:210).

After implementation, the organization must continuously monitor performance to determine if the goals from step seven are being achieved, and if these goals should be adjusted upward. Metrics deemed important to the organization are monitored for indication of progression toward the best practice. Step nine is perhaps the most vital step: without implementation and monitoring, the previous effort will have been a waste of time and money (Camp, 1989:205-210; Geber, 1990:42; McReynolds and Fern, 1992:24).

Step Ten: Recalibrate Benchmarks. Recalibration is periodically repeating the benchmark process to ensure the company continues to maintain a quality product or process in the ever-changing market environment. Furthermore, it is a re-check to ensure another company has not eclipsed the industry leader's performance, resulting in the need to set new goals to meet the performance of the new best-in-class. Recalibration is a planned, intermittent process of re-accomplishing the 10-step benchmarking process (Camp, 1989:227-231; Geber, 1990:44).

Continuous monitoring of industry-best practices is essential to stay on the cutting edge, ensuring benchmarks are based on the latest best practice. Benchmarking is not a one-shot affair, but a continuous improvement process.

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Eventually, benchmarking will be incorporated into organizational culture and vision, with individuals seeking best practices on their own (Camp, 1989:227-231; McReynolds and Fern, 1992:21).

There are many different versions of the benchmark technique. All use the same basic steps, at different levels of detail, to accomplish the same goal, e.g., "improving the quality of . . . operations, products, and services. . ." (Mittelstaedt, 1992:301).

Chapter Summary

The researchers reported the results of their extensive literature review in this chapter. General training philosophy was addressed, laying the foundation for a discussion of the reasons an organization administers training. The objectives of training were established, and explanations of the different types of training were offered. Next, the researchers detailed current issues in trucking industry publications relevant to the study area. After this explanation, the importance of the Army's training program was established, the Army's drivers training program was discussed, and the 37th TRANSCOM's driver training program was highlighted.

Finally, the benchmarking process was detailed. First, the technique was defined, and its development was described. Benchmarking's high credibility and validity were discussed, followed by a description of Xerox

Corporation's 10 step benchmarking model. The following
chapter will specify the methodology utilized to answer each
of the investigative questions stated in Chapter I.

III. Methodology

Introduction

Benchmarking was used to make a comparative analysis between the tractor trailer operator training programs of 37th TRANSCOM and Eaton Roadranger Training Institute. Camp defined this technique as "the search for those best practices that will lead to the superior performance of a company" (Camp, 1989:xi). As discussed in the literature review, benchmarking is a relatively new method of improving business operations through comparing chosen processes and/or products of a company against those of a recognized industry leader. "Comparison with outsiders . . . can highlight the best industry practices and promote their adoption" (Tucker, Zivan, Camp, 1987:8).

A functional benchmarking methodology was used to answer the investigative questions posed in Chapter I because the benchmark partner was not a direct competitor. The systematic answering of each investigative question is addressed separately in this chapter.

Investigative Questions

1. **What areas of tractor trailer operator training should be benchmarked?** "The key to determining what should be benchmarked is to identify the product of the business function" (Camp, 1989:41). In this study, the product of the training program was a trained and licensed :/T

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operator. To determine how this product is produced, the researchers separated 37th TRANSCOM's driver training program into specific components to compare the two organizations' programs. The researchers determined benchmark areas from the components by separating military or location specific requirements (i.e., classroom instruction on recognizing German road signs) from common T/T training program elements.

2. Which civilian company is an industry leader in the identified benchmark areas? The second step in Camp's benchmarking process is identifying comparative companies (Camp, 1989:55). In this study, the researchers sought to identify the benchmark partner through a survey of trucking firms who recruit graduates of formal T/T operator programs, and through a search of the industry literature. A purposeful judgment sampling was used to select survey respondents from the population of trucking organizations on file with the Interstate Commerce Commission. The purposeful judgment sample "occurs when a researcher handpicks sample members to conform to some criterion," (Emory and Cooper, 1991:275). A type of non-probability sample, this non-random sampling method allowed the researchers to choose sampling units that honed in on the limited objectives of the study. Although survey sample size was small, the sampling frame was consistent with the purposeful judgment sample criterion and research objectives (Emory and Cooper, 1991:275).

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Before the researchers picked respondents, they developed, pretested, and corrected the survey questionnaire (see Appendix C). The researchers carefully constructed the survey to ensure validity and reliability. To accomplish this goal, the researchers minimized a variety of potential problem areas inherent in the nature of the instrument (Berdie, Anderson, and Niebuhr, 1986:2-3). Two such considerations were question order and question wording (Frey, 1989:137-8, 157-8).

Question order can affect respondent answers as well as interviewer inquiries. The tone with which an interviewer asks a question can change with its position in the questionnaire. Likewise, respondent answers can be different and influenced by previous questions if queries are not properly sequenced. Although randomization of order can help to overcome this problem, it is more important that questions have a clear, orderly flow which the interviewer can understand in order for him to maintain a conversational pitch to his voice. This conversational tone is important to keep the respondent interested, and to prevent him from terminating the interview as a result of confusion or irritation. To pique respondent interest, questionnaires should start with items directly related to the topic of the interview. As this sets the tone for the remainder of the interview, the first question should help establish rapport with the respondent by being engaging, understandable, and non-sensitive in nature (Frey, 1 989:137-44).

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The success of the remainder of the interview will largely be determined by the first question and resulting tone set therein. Respondent interest must still be maintained throughout in order to ensure quality results; respondents tend to grow weary of the interview as it goes on and difficult or demanding questions have been asked. Sensitive questions should be placed near the middle of the survey after less threatening material has been covered and respondent trust gained. Finally, since fatigue and waning interest can affect responses, it is best to place structured, easily answered questions, such as demographics, near the end (Frey, 1989:147-54).

Frey suggests specific guidelines to consider concerning question order, including the following:

1. Interviewer error and respondent burden are reduced if the questions "flow" easily one to another.

2. Avoid including items that do not fit into a question context or seem out-of-place given the purpose of the research.

3. The substance of the first question should be consistent with the topic or research as expressed in the introduction to the interview.

4. Order questions using a logic that will make sense to the respondent.

5. Place easy-to-answer items, such as demographic items, at the end of the interview to avoid inadequate responses due to respondent fatigue (Frey, 1989:156).

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Of equal or greater importance in instrument development is question wording. "The difficulties brought about by the problems of question wording exceed most other sources of distortion in surveys" (Emory and Cooper, 1991:361). Each question should be targeted to collecting specific data required to meet the objectives and goals of the research (Emory and Cooper, 1991:356).

The purpose of each question is to clearly and accurately convey the question's meaning in order to obtain an unbiased and accurate response. Questions addressing superfluous and nice-to-know information should be avoided as these add unnecessary length to the instrument. To achieve this seemingly simple task, questionnaire developers must be wary of several potential pitfalls in fashioning their queries. Particularly significant are question complexity, and specific words and phrases. The old maxim of "keep it short and simple" applies rather well in most instances. Questions which are too long and complicated confuse and/or cause memory problems for respondents, resulting in reduced quality of responses. Although sometimes unavoidable, question complexity can be overcome by funnel and split-question techniques (Frey, 1989:157, 164-6; Berdie, Anderson, and Niebuhr, 1986:22-3).

A multitude of word and phrase problems exist. Technical terms, slang, or jargon should be avoided; instead, simple, general terms are used to reduce ambiguity. Inflammatory words or phrases are inappropriate. Meaningful

words should be substituted for vague terms, and phrases creating a bias or suggesting a particular answer must be eliminated. Correct grammar and sentence structure are desirable (Frey, 1989:177-8). In short, "wording should be as simple as possible without being condescending to [the] respondent" (Frey, 1989:179).

After completion of the initial questionnaire, a pretest of the instrument can be quite useful in detecting weaknesses related to many problems described above. Pretests can be accomplished using colleagues, "respondent surrogates," or actual respondents. Initial questionnaire drafts can be reviewed by colleagues or others working on the research before actual pretesting begins. Alternatively, pretesting can be executed by trying the instrument on subjects who have similar characteristics as sample elements in the final survey, or on actual respondents from the survey population. After pretesting, the questionnaire is changed to overcome identified weaknesses (Emory and Cooper, 1991:376; Frey, 1989:180).

The researchers chose telephone surveying to gather data due to its characteristics of speed, high response rates, and ability to reach target elements (Frey, 1989:43-4, 51, 60). This method also allowed the researchers to contact specific personnel within each organization who would be most qualified to answer the questions posed.

Telephone interviewing is not without its disadvantages. Respondents must be available by phone, and

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the length of the interview possible is shorter than for other methods, with 10 to 20 minutes generally the normative range. Additionally, it is not possible to use visual aids, and complexity of questions and responses are more limited than other techniques. Less complete responses can be an outgrowth, and respondents find telephone surveying to be less rewarding than personal interviews (Emory and Cooper, 1991:331-2; Isaac and Michael, 1981:131).

The brevity of the survey overcame many of the inherent problems of instrument development. Demographics were collected at the end of the interview. Structure, content, and wording were first pretested on a colleague, and then on surrogate respondents. Only minor problems were encountered in one question, which were adjusted to address understanding. The first question was designed to create respondent interest, and was also used to gather a vital piece of data for the study. Two specific questions were used to obtain the desired information. Wording was constructed to be simple, yet conform to the industry terminology. Interviewer variability was reduced through the same interviewer performing all surveys.

The researchers overcame the disadvantages of telephone surveying through use of a concise questionnaire and repeated call backs until the appropriate respondents were contacted and interviewed. Visual aids were unnecessary for the surveys, and succinct question structure was applied to keep complexity down.

Content validity was established through the judgmental
method by including only those firms identified by a
trucking industry source as the companies most heavily
recruiting from T/T operator training organizations.
Reliability of the instrument was improved by using the same
interviewer, thereby minimizing interviewer variation.
Since the purpose of the survey was to provide a rough
ordering of subjects, the researchers determined the
reliability of the responses by comparison of response
variability and the objectives of the survey, in accordance
with Emory and Cooper (Emory and Cooper, 1991:187-9).
Practicality was achieved through instrument brevity and a
small, pinpointed sample size reflective of the specific
group targeted.

The two areas of interest in the survey were the best
T/T operator training organizations from across the U.S.,
and the measures used to determine those organizations.
These two questions allowed researchers to identify the
industry leader in T/T operator training, and determine the
reasoning behind respondents' estimation of the best.

The criterion of "most successful operations in the
trucking business in calendar year 1991" was originally used
in choosing respondents. In the trucking industry, success
is measured by operating revenue and operating ratio
(Porter, 1992; Hess, 1992). The researchers chose operating
revenue since operating ratio did not provide a
differentiating factor; many small, medium, and large

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companies had indistinguishably close operating ratios. The top six trucking companies in regard to calendar year 1991 operating revenues were selected for surveying.

While conducting these telephone surveys, the authors soon discovered they had used the wrong criterion to select respondents. The selected companies did not hire newly licensed graduates from training organizations. Many only hired experienced drivers which they could lure away from other trucking companies, or recruited and trained drivers internally from positions like dock worker. The appropriate criterion was trucking organizations which heavily recruit novice operators from formal training programs.

Based on this new yardstick, four new trucking companies were identified: J.B. Hunt Transport Inc., Schneider National Inc., Victory Express Inc., and Werner Enterprises (Rianer, 1992). This sample size of four firms also represented a purposeful judgment sample of trucking firms most heavily recruiting from formal T/T training organizations. These four trucking companies were then surveyed with the adjusted survey instrument.

Responses to survey questions were analyzed using ordinal scales. Results of the literature review and survey responses were combined to rank T/T operator training organizations. Mode was used to identify the industry leader in T/T operator training. Mode was also used to rank reasons why the industry leader was considered the best training organization.

3. **How does the 37th TRANSCOM conduct tractor trailer operator training?** In order to compare an organization's processes against an industry leader's, an organization must first study its own performance. "Without a full grasp of . . . [its] own activities, gathering data from other companies is useless, because . . . [management has] no way of making any comparisons" (Day, 1992:70).

To study 37th TRANSCOM's driver training program, the researchers performed an exploratory data analysis (EDA) of Phases I and II of the program. Exploratory data analysis is a technique used in studies in which causal inferences are not established. This approach allows the data to drive the search for details of the problem rather than the data fitting pre-determined categories not requiring examination by the researcher (Emory and Cooper, 1991:467-9). Using EDA, the researchers segregated the first two phases into their major components. Of these major components, only those elements similar to civilian T/T training programs were chosen for comparison against ERTI's training processes, which are identified in investigative question four. For example, German law instruction was not included in the comparison.

4. **How does the civilian industry leader conduct tractor trailer operator training?** Before the two organizations' training programs could be compared, information on ERTI's program had to be collected and analyzed. The researchers conducted a site visit to gather

data through personal interviews, observations, and written programs of instruction.

The researchers again used EDA to analyze the collected information to determine how ERTI conducted T/T operator training. The ERTI program was broken down into the six benchmark categories identified in investigative question one. The researchers determined the training processes employed by ERTI. This segregation into the six areas allowed the researchers to compare 37th TRANSCOM's driver training process to ERTI's training process in the final investigative question.

5. What performance gaps exist between 37th TRANSCOM's driver training program and the selected industry leader's training program? Performance gaps signify differences in the partners' training programs. As stated in the benchmarking literature review, comparative analysis of internal operations to operations of the industry leader can be accomplished by qualitative and quantitative methods (Camp, 1989:129).

Qualitative analysis should precede a quantitative analysis. ". . . [W]hat is wanted is an understanding of practices first, then quantification of the effect of the practices to reveal the size of the opportunity" (Camp, 1989:140). Qualitative analysis entails a word description of the process, broken down to a level of detail which is quantifiably significant, based on the judgment of the

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investigator. The investigator's task is to segregate the process into a series of steps (Camp, 1989:129).

Quantitative analysis follows qualitative in order to measure the size of the gap and opportunity for improvement. Quantification allows determination of how much improvement is possible in a process if the best practice is implemented (Camp, 1989:135, 138).

Camp acknowledges four ways to recognize best practices:

1. Clear superiority: practices which are recognized immediately as obviously superior when observed, based on the knowledge of the observer.

2. Large quantified opportunity: benchmark practices which score substantially better on the relevant measures.

3. Expert judgment: internal company experts or consultants who, by their years of experience with the respective process, label some practices as superior.

4. Recurring practices: the same practices are observed many times on several site visits (Camp, 1989:144-5).

In order to determine the gaps between 37th TRANSCOM's driver training program and ERTI's T/T operator training program, the researchers did a side-by-side comparison of the qualitative and quantitative analysis presented in investigative questions three and four. Components of each program were compared to determine differences, including course content and depth of coverage. Additionally, the

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researchers analyzed the time spent on teaching each component to identify differences in the amount of time dedicated to each. Clear superiority and large quantified opportunity were used to recognize differences between the best practices of the industry leader and 37th TRANSCOM.

Chapter Summary

In this chapter, the methodology for conducting the research study was explained by describing how each investigative question was answered. In Chapter IV, the researchers report the research findings obtained from an analysis of the various pieces of data. Finally in Chapter V, they offer conclusions which resulted from a comparison of the T/T operator training programs of 37th TRANSCOM's and ERTI, as well as recommendations for further research.

IV. Findings

Introduction

In this chapter, the researchers report their findings to investigative questions posed in Chapters I and III. Methodologies described in Chapter III for each question were used to identify these findings.

Investigative Questions

1. **What areas of tractor trailer operator training should be benchmarked?** The researchers identified the following benchmark areas:

   1. Entrance requirements.
   2. Course contents.
   3. Instructor qualification criteria.
   4. Teaching aids.
   5. Equipment.
   6. Evaluation.

   They chose these six general areas because they cover all major components of 37th TRANSCOM's driver training program, with the exceptions of European-specific training (driving and road laws) and non-tractor trailer training.

2. **Which civilian company is an industry leader in the identified benchmark areas?** The researchers used a telephone survey, in conjunction with a literature review, to poll firms most heavily recruiting from formal T/T operator training programs. Survey respondents were J.B.

Hunt Transport Inc., Schneider National Inc., Victory Express Inc., and Werner Enterprises. Survey response rate was 100 percent.

Survey Results. To identify the civilian industry leader, the researchers used mode to rank the combined results of survey responses and the literature search. Rank ordering these results produced Eaton Roadranger Training Institute as the industry leader in the U.S. for training T/T operators. The following results tabulation shows the rank ordering of training organizations (organizations with equal scores are listed in alphabetical order):

Organization	Mode
Eaton Roadranger Training Institute (Kalamazoo, MI)	4
C-1 Professional Training Center (Indianapolis, IN)	3
Oklahoma Vocational Technical (Drumright, OK)	2
Career Education, Inc (Prairie Hill, TX)	1
Clark Vocational Technical (Springfield, OH)	1
Cole Training Institute (Bangor, ME)	1
Commercial Driver Training, Inc (West Babylon, NY)	1
Crete Carrier Corporation (Lincoln, NE)	1
Diesel Driving Academy, Inc. (Shreveport, LA)	1
Diesel Institute of America (Grantsville, MD)	1
Fort Scott Community College (Fort Scott, KS)	1
Krowo College (Neosho, MO)	1
Mideast Ohio Vocational Technical (Zanesville, OH)	1
Morgan Community College (Fort Morgan, CO)	1
Pittsburgh Diesel Institute (Pittsburgh, PA)	1

The following criteria were given by survey respondents as criteria they used to rate training programs. Again, mode was used to rank criteria, which resulted in selecting ERTI as the industry leader.

Criteria	Mode
Curriculum/grading system	3
Response to concerns about curriculum	2
Retention	2
Accident rates	1
CDL completion	1
Customer service	1
Equipment used	1
Facilities	1
Number of hours in program	1
Road test of graduates	1

Eaton Roadranger Training Institute. Eaton Roadranger Training Institute is "a full service truck driver training school offering programs for all levels of experienced and non-experienced students or programs customized for carriers" (Eaton Roadranger Training Institute, undated). Founded in 1988, the school is a reaction to a 1986 industry survey by Eaton Corporation inquiring about ways Eaton could help the trucking industry. One surprising answer was to help alleviate the driver shortage problem. Hence, ERTI was conceived (Mangold, 1993a).

The ERTI program, based on 1985 DOT guidance mentioned in the literature review of civilian trucking issues, has positively impacted the trucking industry. For example, Eaton graduates approximately 300 new T/T drivers annually. Its placement rate with trucking industry firms since 1988 has been 95 percent. The ERTI program is also helping combat the retention problem addressed in Chapter II. Although the literature search did not produce statistics on ERTI's success, company records indicate 80 percent of ERTI's graduates placed in driving jobs since 1988 are still in the industry as drivers. Eleven trucking firms recruit from ERTI regularly, and over 200 companies have recruited from ERTI since its inception (*Eaton Roadranger Training Institute*, undated; Parks, 1993; Mangold, 1993a).

The ERTI mission is to

enhance the sales of Eaton truck components to our customers in the United States trucking industry through

    - Providing the highest quality trained truck drivers in the United States

    - High quality specialized training

    - Dedication to the flexibility to meet our customer's needs

    - Cooperation with our component business and sales/service partners as a world class support organization. (*ERTI Mission Statement*, 1992)

Management at ERTI realizes it must provide quality-trained driver graduates to the trucking industry. Anything less would reflect badly not only upon the program, but on the rest of Eaton Corporation as well. Management feels an

adverse opinion of its training program and graduates would
also adversely impact corporate component sales. As a
result, ERTI is not looked at as a profit center, but a way
to enhance component sales through helping the industry, and
through graduating drivers who have been trained on Eaton
equipment (Mangold, 1993a).

College Affiliation. Eaton is a vocational school
associated with Kalamazoo Valley Community College (KVCC).
As a result of this association, ERTI offers its students
financial aid, counseling, and college credits. Completion
of the T/T driver program nets each graduate 16.3 credit
hours toward completion of a Certificate of Transportation
from KVCC. A one year program, the Transportation
Certificate

> . . . is designed to prepare students for entry
> level positions as over-the-road professional
> tractor/trailer drivers in intrastate and
> interstate commerce, either as a fleet driver for
> freight companies or as an independent
> owner/operator. (Certificate in Transportation,
> undated)

However, ERTI management emphasizes their graduates are not
ready for solo truck operations, but need the next level of
over-the-road training normally provided by hiring
companies. This next level of training consists of company
OJT (Parks, 1993; Course Catalog, 1992:5; Certificate in
Transportation, undated; Mangold, 1993a; Houtman, 1993).

Program Certification. The ERTI program is
certified by PTDIA, the only T/T training program
certification organization in the U.S. for formal T/T

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programs. Additionally, the program is accredited through KVCC (*Eaton Roadranger Training Institute*, undated; Mangold, 1993a).

Additional Training Programs. In addition to its main T/T training program, ERTI conducts other T/T-associated training. It offers a two-week refresher course aimed at advancing the skills of drivers who have had previous T/T experience (i.e., military or other formal T/T school graduates) to current standards. Another program is the train-the-trainer course. This course teaches trucking company personnel how to instruct new hires who have limited driving experience in the trucking industry and need OJT before being allowed to drive solo. Finally, ERTI conducts the state's decision driving course. This one-day course, partially sponsored by the Michigan Department of Transportation, is intended to teach T/T drivers how to react in certain accident situations and how to avoid other situations. The instructors teach students how to use 100 percent of the vehicle's capabilities to avoid accidents (*2 Week Refresher Course*, undated; *Eaton Corporation Brochure*, undated:1; *Decision Driving*, 1992; Mangold, 1993a).

3. How does the 37th Transportation Command conduct tractor trailer operator training? The literature review revealed 37th TRANSCOM's training program is divided into four phases.

Phase I: Drivers' Academy.

Phase II: Standardization Instructor Driver Program.

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Phase III: Refresher Driver Training.

Phase IV: Remedial Driver Training (37th TRANSCOM Reg. 55-108, 1991:9-2).

Again, only Phases I and II are included in the scope of this study.

Entrance Requirements. Admission requirements for driver training are specified in 37th TRANSCOM Regulation 55-108, *Highway Operations*. Students must meet the following requirements:

1. Be interviewed to ensure they do not have any problems that would hinder training.

2. Pass a physical examination. The exam must include an eye examination, a color blindness test, and a complete Battery 2 test. The Battery 2 test determines drivers' ability to react.

3. Have their personnel records and pertinent health records screened for disqualifying items (37th TRANSCOM Reg. 55-108, 1991:9-2).

In addition to requirements specified by 37th TRANSCOM, students must pass routine drug testing. If they fail the drug test, they are grounded pending commander's evaluation and disposition of the case. There is no special minimum age requirement for the program. The Army's minimum age requirement for enlisting is 17; once enlisted, the Army trains and licenses T/T drivers without regard to age. Finally, the driver's program does not require students to possess a valid motor vehicle operator's license. Although

a license is not required, only one-half to one percent of students do not possess one (Hixon, 1993b).

Course Content. The driver training program curriculum is based on guidance from 37th TRANSCOM. The 37th TRANSCOM provides a list of topic areas and hours which, at the minimum, are required subjects for the drivers' academies (Appendix D). The program is designed to train drivers to operate 37th TRANSCOM's T/Ts in support of the unit's mission. One common theme emphasized throughout training is safety. Although no classes are titled "safety", this topic is repeatedly addressed during the four phases of training (Hixon, 1993b). Table 2 depicts the 37th TRANSCOM's required instruction within the scope of this research.

However, 37th TRANSCOM gives latitude to the drivers' academies regarding subjects included in the curriculum. This latitude allows each drivers' academy to tailor the instruction to meet its needs (37th TRANSCOM Reg. 55-108, 1991:Appendix D; 37th TRANSCOM LOI, undated:4).

Based on topic area and time guidance from 37th TRANSCOM, each drivers' academy has developed an expanded curriculum for meeting 37th TRANSCOM's needs. For example, the 53d Transportation Battalion Drivers' Academy conducts two hours of classroom instruction on "mail procedures" not required by 37th TRANSCOM (37th TRANSCOM Reg. 55-108, 1991:Appendix D; 53d Transportation Battalion Training Schedule, undated). The 53d Transportation Battalion's

Drivers' Academy Training Schedule is included at Appendix
B.

TABLE 2

37TH TRANSCOM REQUIRED INSTRUCTION

General Instruction Category	Specific Instruction	Training Hours
Documentation	- Accident Reports - Documentation Including TCMD's and Truck Manifests	2 2
Hazardous/ Sensitive Cargo	- Petroleum, Oils, and Lubricants (POL) - Hazardous Cargo - Classified and Sensitive Cargo Procedures	4 8 1
Specific Vehicle Operations	- M915A1 (Truck Tractor, 6 x 4, Automatic Transmission) - M915 (Truck Tractor, 6 x 4, Standard Transmission) - M911 (Heavy Truck Tractor; 377th Transportation Company Only) - Trailers	2 2 2 2
Maintenance	- Operator Maintenance - TAMMS	8 2
Commitment	- Commitment - Breakdown and Overnight Procedures - Roadside Spot Checks - Map Reading - Vehicle Security - Blocking and Bracing	2 2 1 2 .5 1

(37th TRANSCOM Reg. 55-108, 1991:Appendix D)

Phase I classes are primarily taught in a classroom
environment. As noted in Chapter II, a typical day begins
at 0545 hours and ends at 1700 hours (Appendix B). From
0545 hours to 0900 hours, the academy conducts its non-
driver training business (i.e., physical training, personal
appearance inspection, etc). Instruction begins at 0900

hours and concludes at 1700 hours, with a one-hour lunch break (53d Transportation Battalion Training Schedule, undated). Following the classroom portion of training, each driver receives 40 hours of hands-on training on the driving range. This training consists of basic forward driving, hooking and unhooking the tractor and trailer, backing the trailer into various shaped docks, and serpentine backing exercises. Once students have passed all written and hands-on tests, they graduate from the drivers' academy during a formal ceremony and are ready for Phase II training (Hixon, 1993b).

Phase II training is conducted under close supervision of an SID in the soldier's assigned company. Training is conducted on the model of T/T the soldier will operate, and on the types of missions he will be assigned after program completion. For example, if a soldier is assigned to a company with a mail-hauling mission, he is trained to haul general cargo and mail, but not POL. Similarly, heavy equipment transport drivers are not trained to haul hazardous materials, only heavy equipment such as tanks, bulldozers, etc. (Hixon, 1993b).

The instructor-to-student ratio is one-to-one. Each SID is responsible for turning his student into a competent driver, capable of pulling commitments on his own. This on-the-rc 1 training consists of real commitments, requiring students to combine classroom knowledge, range driving skills, and on-the-road experience (Hixon, 1993b). Per 37th

TRANSCOM requirements, students must have at least 500 miles of shotgun (passenger/observer) training, and 2,500 miles of behind-the-wheel training, to complete Phase II. Typically, it takes students 5 duty days to meet shotgun training requirements and 20 duty days to meet behind-the-wheel requirements (Hart, 1993; Young, 1993; Thornton, 1993).

It takes 5 and 20 days, respectively, to accumulate the required miles due to the variety of commitment lengths, associated work, and time delays. The T/T driver's duty day begins in the motorpool with pre-operations preventative maintenance checks and services (PMCS) on the T/T. Mechanical deficiencies must be corrected prior to leaving the motorpool. Drivers are given their operations order (i.e., where to go, what to pick up, where to deliver), and then briefed on safety guidelines and any special instructions for their commitment. Drivers are also required to perform PMCS while on the road, and once drivers are finished for the day, they perform post-operations PMCS (37th TRANSCOM Reg. 55-108:Appendix D).

These commitment requirements, in addition to driving time, cause drivers to work 10-hour days. Given duty day length, drivers take 40 hours to complete shotgun training and 200 hours to complete behind-the-wheel training to meet minimum 37th TRANSCOM requirements.

Instructor Qualification Criteria. Instructors and SIDs are selected from the battalion's task vehicle

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drivers who have been in the command long enough to meet the following requirements:

'1. Drivers' academy instructors must be in pay grade E-4 or above, must have driven 30,000 accident/incident-free miles for 37th TRANSCOM, must not have any driving-under-the-influence (DUI) convictions, and must attend a three-week instructor school. This school consists of two weeks of classroom instruction and one week of hands-on training with students. The aspiring instructor must pass a written test at the end of the three weeks.

2. Standardization Instructor Drivers must be in pay grade E-5 or above, must have accumulated 50,000 accident/incident-free miles for 37th TRANSCOM, and must not have any DUI convictions. Both drivers' academy instructors and SIDs must also meet standard Army health and fitness requirements (37th TRANSCOM Reg. 55-108:Appendix D; Hixon, 1993b).

Teaching Aids. Drivers' academy instructors have access to films, overhead projectors, television sets, video camera recorders, documents and forms, and chalk boards to assist them in their job. In addition to incorporating applicable regulations into the instruction, instructors use 37th TRANSCOM Regulation 55-108, *Highway Operations*, as their primary text. To aid instructors in teaching maintenance, they have access to battalion maintenance facilities (Hixon, 1993b).

The SIDs teach students in the motorpool, in maintenance facilities, and on the road. They have maintenance manuals and tools required for the job. In addition, they have paperwork needed to reinforce classroom instruction and to perform the commitment (Hixon, 1993b).

Equipment. The drivers' academy instructors and SIDs have access to ample T/Ts to train students. Medium truck companies use either M915 or M915A1 tractors and a variety of trailers. The heavy truck company uses M911 tractors and M747 trailers. Students are trained on models of equipment they will operate after licensing (Hixon, 1993b).

Evaluation. Soldiers must complete the classroom portion of training by passing written exams. Once students have passed the German law and road signs tests, they are issued learner's permits. The minimum passing score is 90 percent for all tests. Students who fail a test are given additional training and take the exam again (Hixon, 1993b).

The next evaluation hurdle for students is graduating from range training. To be ready for Phase II, students must pass a hands-on range test. Again, additional training is provided for soldiers not able to pass the test (Hixon, 1993b).

To complete Phase II's on-the-road training, students must prove their ability to perform all tasks required to pull a commitment (from maintenance to paperwork to driving skills). Students pass when they convince their SID they

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are competent in every student driver task (see Appendix E).
Next, providing the chain of command agrees with the SID's
assessment, the soldier is licensed. At this point, Phase
II ends, and the driver is considered fully qualified to
operate a T/T. Soldiers who cannot pass the exam are given
additional mileage requirements and continue training under
supervision of their SID until they meet the new mileage
requirements and pass the road test (Hixon, 1993b).

4. How does the civilian industry leader conduct
tractor trailer operator training? Eaton Roadranger
Training Institute's training program is a 323 hour course
based on DOT and PTDIA requirements. The course is offered
on an 8 week full-time basis, or on a 16 week part-time
basis, with classes starting every two weeks. The
instructors use proven instructional methods developed by
Northern Arizona University, and try to improve on those
techniques where possible. One ERTI goal is to create a
quality training program which can be a baseline for others
to follow (Mangold, 1993a).

Entrance Requirements. Admission requirements for
ERTI's T/T training course are based in large part on the
Code of Federal Regulations (CFR) 49. In addition to the
usual enrollment paperwork required for attending schools of
higher education, applicants must meet the following
requirements:

1. Have a high school diploma or equivalent.

2. Be at least 21 years old at graduation.

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3. Have a valid driver's license.

4. Have an appropriate T/T training permit or license.

5. Meet requirements of *CFR 49,* Part 391, Qualification of Drivers.

6. Pass a DOT physical and submit it to ERTI.

7. Submit a negative pre-enrollment drug test to ERTI.

8. Have a good work history, good character, and good driving record for employment as a driver in the trucking industry (*Course Catalog,* 1992:3; *CFR 49,* 1992: 572-3, 579-80).

The applicable portions of *CFR 49,* Part 391, for admission to ERTI appear in Appendix F.

Course Content. In Table 3, ERTI's curriculum (Appendix G) is broken down into the five general instructional categories used in investigative question two. Topic areas falling outside those five categories are listed in an "other" section at the end.

The ERTI program is a broad, generic T/T operator training course (i.e., tractor, and box or flatbed trailer). Management feels becoming too specific toward a certain carrier or carriers' wishes would decrease its effectiveness to the industry and to ERTI students. Another management goal is to produce a successful T/T operator, defined as follows:

1. Has continued employment in the trucking industry.

2. Is relatively accident free.

TABLE 3

ERTI COURSE BREAKDOWN

General Instruction Category	Specific Instruction	Class Hours	Lab Hours	Range Hours	Behind-the-Wheel Hours
Documenta-tion	- Cargo - Accident Procedures	3.75 13.75			
Hazardous/ Sensitive Cargo	- Hazardous Materials, Driving and Parking Rules - Special Rigs Training	1 1			
Specific Vehicle Operations	- Vehicle Inspections - Control Systems - Basic Control - Proficiency Development - Safe Operating Practices - Vehicle Systems	2 2.5 3.5 1.5 8.25 13.25	4 55 55.5	 11 10.5 5	 6 22.75
Maintenance	- Preventative Maintenance and Servicing - Diagnosing and Reporting Malfunctions	8.75 4	16.5		
Commitment	- Securing Cargo - Map Reading	2.5 2			
Other	- Orientation - DOT Regulations - Driver Energy Awareness Conservation Training - Handling Cargo - Hours of Service Requirement - Trip Planning - Personal Health/Safety - Public/Employer Relations	3.25 20 8 6.5 5.75 2.75 5 4.25	1 32.5		

(*Professional Truck Driving Course*, undated:7-27; Mangold, 1993a; Mangold, 1993b)

3. Is drug free.

4. Is happy with his job (Houtman, 1993; Mangold, 1993a).

In lab, students practice skills they have been taught in class. Students secure cargo with straps, chains, binders, and winches. They practice covering cargo with ropes and tarps, and secure hazardous cargo placards to equipment. Students use forklifts to practice loading, unloading, and positioning simulated freight on trailers. In the near future, ERTI will add a simulator to their lab environment which mimics cab operations under driving conditions. The simulator will be used to enhance student training (*Professional Truck Driving Course*, undated:6; *Course Catalog*, 1992:2; Mangold, 1993a).

During range and behind-the-wheel training, the students practice a variety of skills. Range training consists of 26.5 hours of basic forward driving, shifting, coupling/uncoupling, backing, and vehicle inspections. Behind-the-wheel training consists of 28.75 hours of practicing skills developed on the range, and learning new skills of communications, speed and space management, night operations, extreme weather operations, emergency procedures, and skid control and recovery (*Professional Truck Driving Course*, no date:11-17).

Instructor Qualification Criteria. In order to produce qualified T/T operators, ERTI must have high-quality instruction, and therefore, high-quality instructors. To be hired as an ERTI instructor, individuals must meet the following general criteria:

1. Have teaching experience or preparatory education in teaching.

2. Have at least two years safe T/T driving experience.

3. Meet minimum T/T licensing criteria.

4. Meet physical requirements of *CFR 49,* Part 391.

5. Meet proficiency requirements for behind-the-wheel instruction.

6. Have demonstrated knowledge of safe driving practices and principles, and knowledge of applicable T/T laws and regulations.

7. Have driving ability greatly exceeding requirements of the course being taught.

8. Have knowledge of effects of each type of instruction utilized by ERTI.

9. Have sufficient depth of knowledge to answer student questions (*Criteria for Voluntary Certification,* 1989:35-9).

The complete requirements are listed in Appendix H.

Teaching Aids. The school uses a variety of teaching aids in its program. Instructors use overhead charts and projectors, films, slide presentations, and JJ Keller video tapes as a basis for classroom instruction. Students also learn in class through use of maintenance manuals, troubleshooting charts, and wall charts. Eaton instructors use *Bumper to Bumper: The Complete Guide to Tractor-Trailer Operations,* a book on truck driving and

related activities, as the course text. The book's table of contents appears in Appendix I (*Professional Truck Driving Course*, undated:6; Byrnes and others, 1988:v; Mangold, 1993a).

Truck components built into mock-up systems provide instructors with the ability to enhance verbal instruction with visual aids of actual component operation. These systems allow students to see how components actually function in many areas, like braking and shifting. For example, the transmission mock-up is a working cut-away model used to demonstrate several concepts, such as, synchronizing gear speed for smooth shifting between gears. Some of the mock-up systems include air brake systems, transmissions, and engines (Mangold, 1993a).

Additional teaching aids can be traced to ERTI's parent organization. The school is located in an old Eaton corporate manufacturing facility, providing ERTI a large parking lot, approximately 10 acres, which has been converted into a lighted, paved on-site driving range. Instructors enhance maintenance-related instruction by using the maintenance building adjacent to the school. The corporation's Marshall Proving Grounds driving range is also available for school use. Eaton corporate plants in the area provide actual docks and facilities for students to practice backing and parking skills. Finally, students occasionally haul freight between plants for the

corporation, giving them realistic training (Mangold, 1993a; *Course Catalog*, 1992:2).

Equipment. Eaton has 15 tractors and 10 box trailers for students to drive during range and behind-the-wheel training. It also has one flatbed trailer which is used by instructors and students for demonstrating cargo securing, covering, and loading operations. Finally, ERTI uses its one tank trailer to give students a rudimentary understanding of how liquids act under actual transport conditions (Mangold, 1993a; Houtman, 1993).

The ERTI program benefits from its parent organization, Eaton Corporation. Although exteriors of ERTI's tractors and trailers are older, internal components are new Eaton components, or new Eaton products used in a test-market type atmosphere (Mangold, 1993a).

Evaluation. At the end of the course, Michigan's CDL test is given as the final exam. Students must score 80 percent or greater in each knowledge area to pass. On the skills test, students must demonstrate successful performance of all skills listed in *CFR 49*, Part 383, Commercial Driver's License; Requirements and Penalties. Knowledge and driving skills required by *CFR 49*, Part 383 appear in Appendix J. If the student passes both portions of the exam, he receives his program completion certificate from ERTI. Michigan-resident students also receive their CDL; however, out-of-state students must take the CDL test in their home state. Students scoring under 80 percent may

attend a two-week remedial course to raise their score to 80 percent or higher (Mangold, 1993a; *CFR 49*, 1992:510-12; 516).

5. **What performance gaps exist between 37th TRANSCOM's driver training program and the selected industry leader's training program?** In comparing the two programs in the benchmark areas, the researchers identified performance gaps in each of the six areas. The researchers describe the performance gaps within each of the six benchmark areas separately. The following symbols are used in tables in this investigative question under the heading "Gap":

+ means 37th TRANSCOM experiences a positive gap.

- means 37th TRANSCOM experiences a negative gap.

0 means 37th TRANSCOM experiences a parity gap.

Entrance Requirements. Table 4 shows the comparison of the first gap area, entrance requirements for students. There are two negative gaps in entrance requirements: age and licensing. The gap in minimum age requirement is a result of different government agency policies. As stated before, the minimum age for enlisting in the Army is 17, and once enlisted, the Army trains and licenses T/T drivers without regard to age. On the other hand, federal regulations require civilian T/T drivers to beat least 21 for interstate operation. Therefore, ERTI requires students to be at least 21 years old at graduation (Greathouse, 1993; *CFR 49*, 1992:572).

TABLE 4

ENTRANCE REQUIREMENTS

Requirement	37th	ERTI	Gap
Education	Diploma	Diploma	0
Age	17	21	4
License	None, but preferred	valid motor vehicle operator's license	-
Training permit	Yes	Yes	0
Physical exam	Yes	Yes	0
Drug test	Yes	Yes	0
Driving record	Yes	Yes	0
Character	Yes	Yes	0
Work history	Yes	Yes	0

(Hixon, 1993b; *Course Catalog*, 1992:3)

The minimum age requirement is significant because statistics show younger drivers are involved in more accidents. In 1991, 32 percent of drivers under 20 were involved in accidents. However, only 21 percent of drivers 20-24 were involved in accidents (*1991 Property/Casualty Insurance Facts*, 1991:77). By training younger drivers, 37th TRANSCOM risks more accidents.

The second gap in entrance requirements, licensing, is due to a CDL specification that T/T drivers possess valid motor vehicle operator's licenses. As a result, ERTI requires students to hold a current license. The CDL specification does not govern Army T/T drivers, and

therefore, the drivers' academy does not require students to possess a motor vehicle operator's license. However, only one-half to one percent of the students enroll without a motor vehicle operator's license (Greathouse, 1993; Hixon, 1993b; *CFR 49*, 1992:504, 572).

Course Content. A comparison of course content for the two programs appears in Table 5; for a more detailed course breakdown and comparison, see Appendix K. The total number of training hours included in ERTI's program is influenced by Kalamazoo Valley Community College; KVCC requires at least 320 program hours for students to qualify for financial aid. Specific content area requirements for ERTI are driven by DOT and PTDIA requirements as described in the literature review (Mangold, 1993a). The instruction included in 37th TRANSCOM's driver training program is dictated by mission needs of 37th TRANSCOM.

In the five major content areas in Table 5, the researchers identified numerous gaps. In general, ERTI's curriculum includes more classroom hours. One significant exception is hazardous/sensitive cargo instruction. The drivers' academy teaches 11 more hours on these subjects.

In addition to DOT and PTDIA requirements, another contributing factor to the gap is that Eaton Corporation provides ERTI mock-up truck systems for use in lab training. These training aids allow ERTI instructors to spend many hours demonstrating the inner workings of many T/T systems

TABLE 5

COURSE CONTENT

Content	37th (hours)	ERTI (hours)	Gap (hours)
Classroom:			
Documentation:	4	17.5	− 13.5
Hazardous/sensitive cargo:	13	2	+ 11
Specific vehicle operations:	8	29	− 21
Maintenance:	10	12.75	− 2.75
Commitment:	8.5	4.5	+ 4
Other:	0	57.25	− 57.25
Lab:			
Specific vehicle operations:	0	114.5	− 114.5
Maintenance:	0	16.5	− 16.5
Other:	0	33.5	− 33.5
Range:	40	26.5	+ 13.5
Shotgun:	40	0	+ 40
Behind-the-wheel experience:	200	28.75	+ 171.25

(37th TRANSCOM Reg. 55-108, 1991:Appendix D; *Professional Truck Driving Course*, no date:7-21)

(Mangold, 1993a; *Professional Truck Driving Course*, no date:7-27; Hixon, 1993b).

In the second gap area, lab training time, there is a large negative gap of 114.5 hours. One reason ERTI spends a great deal of training time in a lab environment is, as noted before, Eaton Corporation has provided ERTI with many

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mock-up truck systems. The drivers' academy does not conduct lab training (*Professional Truck Driving Course*, no date:7-27; 37th TRANSCOM Reg. 55-108, 1991:Appendix D; Hixon, 1993b).

In the last three major content areas (range, shotgun, and behind-the-wheel), 37th TRANSCOM experiences a large positive gap. There is a positive gap of 13.5 range hours, 40 shotgun hours, and 171.25 behind-the-wheel hours. The positive gap in shotgun hours exists because ERTI does not conduct this training (*Professional Truck Driving Course*, no date:7-27; 37th TRANSCOM Reg. 55-108, 1991:Appendix D; Hixon, 1993c).

Instructor Qualification Criteria. There is one negative performance gap, prior T/T driving experience, in instructor qualification criteria. The negative gap of at least 6 months can be attributed to the DoD's overseas rotation policy. The normal tour of duty for soldiers in Germany is two years for unaccompanied personnel and three years for accompanied soldiers. The 37th TRANSCOM requires only 9 to 10 months for academy instructors and 17 to 18 months for SIDs in order to maximize instructor time in these positions before their tours of duty end (Hixon, 1993b). A comparison of instructor qualification criteria appears in Table 6.

Teaching Aids. A comparison of teaching aids reveals three negative performance gaps as shown in Table 7.

TABLE 6

INSTRUCTOR QUALIFICATION CRITERIA

Criterium	37th SID	TRANSCOM Academy	ERTI	Gap
Prior T/T driving experience	17-18 months	9 - 10 months	>=24 months	>= 6 months
Outstanding job performance record	Yes	Yes	Yes	0
Knowledge of subject matter	Yes	Yes	Yes	0
Teaching/training experience	Yes	Yes	Yes	0
Physical requirements	Yes	Yes	Yes	0

(Hixon, 1993a; Hixon, 1993b; *Criteria for Voluntary Certification*, 1989:35-39)

As stated earlier, the first gap, mock-up truck systems, is a result of Eaton Corporation providing ERTI with working, visual component models. Again, these training aids allow ERTI instructors to demonstrate inner workings of many T/T systems (Mangold, 1993a).

The second gap, forklifts, is caused by the requirement for ERTI to teach students how to load, unload, and position freight. This training is not conducted by drivers' academy instructors because 37th TRANSCOM drivers do not operate forklifts to load or unload cargo (Hixon, 1993a; Mangold, 1993a).

The third negative performance gap is new components. Again, this gap results from ERTI's relationship to its parent organization, Eaton Corporation, whic provides E.

TABLE 7

TEACHING AIDS

Aid	37th	ERTI	Gap
Overhead charts and projector	Yes	Yes	0
Films/video tapes	Yes	Yes	0
Slide presentations	Yes	Yes	0
Maintenance manuals	Yes	Yes	0
Maintenance facilities	Yes	Yes	0
Cargo	Yes	Yes	0
Text	Yes	Yes	0
Mock-up truck systems	No	Yes	-
Cargo securing devices	Yes	Yes	0
Forklifts	No	Yes	-
Driving range	Yes	Yes	0
Use of organizational facilities	Yes	Yes	0
New components	No	Yes	-

(Hixon, 1993a; *Professional Truck Driving Course*, no date:6)

state-of-the-art components for their tractors and trailers. Eaton Corporation provides these components in order to train students on its newer components, hoping to create a preference for its products. Eaton Corporation believes this tactic will create a demand for its products in the

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future. The drivers' academy has no such special relationship with its parent organization, and does not have a need to create a preference for particular products (*Professional Truck Driving Course*, no date:7-27; Hixon, 1993a; Mangold, 1993a).

Equipment. The 37th TRANSCOM experiences a positive gap in equipment. Students train on the exact models of tractors and trailers they will drive after program completion. Conversely, ERTI trains its students on general equipment, and only on models that contain Eaton components. Therefore, after graduation, an ERTI student may find himself operating an unfamiliar piece of equipment. As a result, ERTI recommends graduates receive OJT from hiring trucking firms (Mangold, 1993a; Hixon, 1993a).

Additionally, the two organizations differ in amount of equipment available for behind-the-wheel training. The 37th TRANSCOM has an unlimited number of vehicles compared to the number of students needing vehicles. On the other hand, ERTI has a fixed number of tractors and trailers on which to train students, so students must share limited resources (Mangold, 1993a; Houtman, 1993; Hixon, 1993b).

Evaluation. In the last benchmark area, all gaps are at parity. Although each program uses different tests, both programs require students to pass both written and behind-the-wheel exams (see Table 8). Eaton tests students with Michigan's CDL exam, and drivers' academy instructors

TABLE 8

EVALUATION

Item	37th	ERTI	Gap
Written exam	Yes	Yes	0
Behind-the-wheel exam	Yes	Yes	0

(Mangold, 1993a; Hixon, 1993b)

and SIDs use tests developed to meet 37th TRANSCOM's needs. Again, 37th TRANSCOM is not governed by CDL requirements (Hixon, 1993b; Mangold, 1993a).

Chapter Summary

In this chapter, the researchers identified six benchmark areas: 1) entrance requirements, 2) course contents, 3) instructor qualification criteria, 4) teaching aids, 5) equipment, and 6) evaluation. They used the combination of a survey and a literature review to determine the industry leader in T/T operator training, i.e., Eaton Roadranger Training Institute. Additionally, they investigated the training methodology used by ERTI and 37th TRANSCOM in their T/T operator training programs. They also described how each benchmark partner conducts its training program.

By comparing training methodologies of the two organizations, the researchers identified the following performance gaps in the six benchmark areas:

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1. Entrance requirements: The researchers found two negative gaps: minimum age of students and licensing. While 37th TRANSCOM accepts soldiers as young as 17, the same minimum age required for enlistment into the Army, ERTI requires students to be at least 21 at graduation due to federal interstate commerce regulations. Similarly, CDL requirements dictate that T/T drivers have a valid motor vehicle operator's license; hence, ERTI requires students to possess same for entry. On the other hand, since a motor vehicle operator's license is not required for enlistment, 37th TRANSCOM does not require one for drivers' academy entry. However, only one-half to one percent enroll without one.

2. Course content: The researchers identified numerous gaps in course content, some positive and some negative. Overall, ERTI requirements are driven by three organizations: KVCC, DOT, and PTDIA. Conversely, 37th TRANSCOM T/T training needs are determined solely by their mission requirements. Another finding was the difference in instruction emphasis. Eaton spends more time in classroom and lab instruction, whereas, 37th TRANSCOM emphasizes more hands-on training. Finally, each uses one type of instruction which the other does not; ERTI does lab training, and 37th TRANSCOM conducts shotgun training.

3. Instructor qualification requirements: The researchers identified one negative gap. While 37th TRANSCOM only requires from 9 to 18 months prior T/T driving

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experience, depending on position, ERTI requires at least two years as a result of PTDIA requirements. The gap is attributed to overseas tour-of-duty length.

4. Teaching aids: The researchers found three negative gaps in this area. As a result of parent corporation support, ERTI has several mock-up truck systems it can use to enhance verbal instruction by visually demonstrating component operation; 37th TRANSCOM does not have any mock-up truck systems. The second negative gap, forklifts, results from the fact that 37th TRANSCOM drivers do not use forklifts to load, unload, or position freight on trailers. On the other hand, ERTI trains its students these skills as required by PTDIA requirements. Finally, the gap in new components results from Eaton Corporation's goal of creating brand preference for their components. The 37th TRANSCOM does not have a need to create a preference for particular products.

5. Equipment: The researchers identified a positive gap in equipment. In addition to having more equipment, 37th TRANSCOM trains drivers on the exact model of equipment they will operate after program completion. In contrast, ERTI graduates may be unfamiliar with the equipment they will drive after graduation due to training on general equipment.

6. Evaluation: The researchers discovered the only parity gap in this benchmark area. Although each uses different tests, both organizations require students to pass

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written and behind-the-wheel exams before program completion.

In Chapter V, the researchers specify their research conclusions and recommendations for further research.

V. Conclusions and Recommendations

Introduction

In this chapter, the researchers develop research conclusions based upon Chapter IV findings. There are significant findings in five of the six benchmark areas: entrance requirements, course content, instructor qualification criteria, teaching aids, and equipment. The researchers offer their interpretations of these findings below. Following conclusions, the researchers offer their recommendations for further research.

Conclusions

Overall, 37th TRANSCOM has a solid T/T driver training program. The program is tailored to provide specific skills needed for job performance immediately after program completion.

As mentioned in Chapter I, the benchmark partners' diverse missions affect the design of their respective training programs. The 37th TRANSCOM trains its drivers with specific jobs in mind. It also trains drivers on the exact model of equipment they will operate. Two phases of instruction provide specific training 37th TRANSCOM drivers will need. Phase I provides specific T/T operations knowledge, while Phase II reinforces this training by providing specific hands-on training in the soldier's

particular job specialty, as well as in general cargo cartage.

On the other hand, ERTI prepares drivers for many different organizations. These organizations haul various types of cargo from bulk commodities to household goods. Consequently, ERTI provides broad-based training for its students, which prepares them to work in many different industries. Providing this broad-based training requires ERTI to conduct more classroom training hours. Students must learn a variety of rudimentary skills to familiarize themselves with the many possible vehicles they may be called upon to drive in their first job. Supplementary training, beyond basic knowledge and skills acquired by students from ERTI, must be obtained from the graduate's new employer. For example, a graduate who works for a company hauling liquid nitrogen needs very specific training on government regulations, product handling, tanker line-haul procedures, and emergency procedures.

Entrance Requirements. Age is the only significant gap under entrance requirements. Although statistics show younger drivers are more prone to have accidents, 37th TRANSCOM would forego use of most of its junior enlisted personnel as T/T operators if it adopted 21 as the minimum age. Since it is not practical for 37th TRANSCOM to use its noncommissioned officers as the sole source of T/T operators, no change to current policy is recommended.

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The second gap noted in entrance requirements in Chapter IV is not significant. Although the drivers' academy does not require its studer's to possess a motor vehicle operator's license, only a minute percentage, one-half to one percent, enroll without this license. Recommend no change.

Course Content. One problem in comparing program course content is instruction on many subjects is intertwined. Therefore, hours of instruction for individual topics cannot be separated. For example, ERTI provides 20 hours of classroom instruction on motor carrier regulations, whereas the drivers' academy does not identify separate hours for teaching regulations. As stated earlier, this does not mean the drivers' academy neglects teaching regulations; on the contrary, instruction is based on regulations. Another instance of this problem occurs in hands-on training conducted during Phase II. Although Phase II's program does not specify maintenance training time requirements, students receive this training as both an observer and a driver. As a result of many subjects being intertwined, a strict side-by-side comparison of subjects and hours is not possible.

Although the researchers identified gaps in the five major course content areas, not all these gaps are significant to 37th TRANSCOM's driver training program. The researchers believe the major difference in course content lies in the mission of each organization as described above.

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In general, ERTI spends more time training in classroom and lab settings; 37th TRANSCOM spends the majority of its time conducting hands-on training. As mentioned above, ERTI focuses on a broad-based curriculum which is better taught in a classroom or lab setting. The 37th TRANSCOM's job-specific training requires less classroom time and more hands-on time to be effective. As a result, when compared to 37th TRANSCOM drivers, ERTI graduates have a greater knowledge base in T/T operations, but are not prepared to begin solo driving operations. Conversely, 37th TRANSCOM drivers are not as knowledgeable in general T/T operations as ERTI graduates; however, the former are well prepared for the job already awaiting them.

One advantage of ERTI's numerous classroom hours is students receive comprehensive instruction on how specific vehicle components and systems operate. As a result, they have a greater understanding of how components are integrated into a complete T/T system. The researchers believe this knowledge allows drivers to prevent excessive T/T wear and tear, to detect maintenance problems earlier and more accurately, and to be safer drivers. The researchers recommend 37th TRANSCOM consider adding training on specific vehicle components and systems operations.

Instructor Qualification Criteria. There is one significant negative gap in this benchmark area: prior T/T driving experience. The researchers believe ERTI's requirement provides for better instructors. Given two- and

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three-year tours of duty, requiring a potential drivers' academy instructor or SID to have two years of prior T/T driving experience would severely reduce the pool of qualified candidates and increase instructor turnover. In addition, by the time a new instructor is fully integrated into his position, he would spend little time teaching before his tour of duty ended.

The researchers recommend the 37th TRANSCOM adopt the two year prior driving experience requirement. To alleviate tour length problems discussed above, recommend instructors and SIDs be assigned to these positions from the outset of their tour, as opposed to transferring them to these positions after partial tour completion. The Army personnel system should assign sufficient soldiers to 37th TRANSCOM who meet minimum driving experience requirements from previous duty assignments in 37th TRANSCOM.

Teaching Aids. Of three negative gaps identified, the researchers believe only one is significant. As stated in Chapter IV, mock-up truck systems allow ERTI instructors to combine verbal instruction with visual demonstration of the operation of a variety of truck components. The researchers believe teaching soldiers truck component operation would result in drivers who better understand how T/Ts operate. Again, the researchers believe this knowledge would allow drivers to prevent excessive wear and tear to equipment, and to detect maintenance problems earlier and more accurately.

The researchers recommend 37th TRANSCOM consider acquiring mock-up truck systems for use in their training program.

The two negative gaps on forklift training and new components are not significant. As for the former gap, since 37th TRANSCOM drivers do not use forklifts to load or unload cargo, its drivers do not need this training. Concerning the latter, as stated in Chapter IV, 37th TRANSCOM does not have a need to create brand preference in truck components. Recommend no changes.

Equipment. The researchers believe 37th TRANSCOM experiences a significant positive gap in this benchmark area. Eaton is limited in the number and types of equipment it can use to train students. On the other hand, 37th TRANSCOM has numerous vehicles, and trains soldiers on the specific model of equipment they will operate after program completion. As a result, unlike ERTI graduates, 37th TRANSCOM drivers are mission capable after program completion without further OJT. Given the advantage 37th TRANSCOM enjoys in this benchmark area, recommend no change.

Recommendations for Further Research

The researchers noted several potential areas for further research.

1. Safety performance. Research could be conducted on on-the-job driver safety performance of graduates of both programs to determine training program effectiveness.

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2. Student evaluation. The content of written requirements and driving specifications could be evaluated for similarities and differences.

3. Student demographics. Recommend research into similarities and differences of students entering each program to determine if the programs are dealing with comparably qualified students.

4. Develop an enhanced 37th TRANSCOM program. Based on conclusions from this research, explore specific subject additions which could enhance 37th TRANSCOM's training curriculum.

5. CDL's impact. Recommend studying the impact of CDL requirements on the Army's T/T driver training program.

6. Benchmark Air Force T/T operator training. Another area of future research includes benchmarking Air Force T/T driver training to either Army or civilian programs.

Chapter Summary

The researchers identified five significant gaps and offered three recommendations for changing 37th TRANSCOM's T/T operator training program. The significant gaps occurred in the following areas:

1. Entrance requirements: Although the researchers identified age as a significant gap, they concluded implementing a minimum age requirement of 21 for T/T operator training in 37th TRANSCOM was not viable. They determined it would not be practical to use noncommissioned

officers as the sole source of drivers while exempting most junior enlisted personnel from operating T/Ts.

2. Course content: The researchers found ERTI's greater classroom hours provided its students greater instruction on specific vehicle system operation, resulting in a greater understanding of how components are integrated into a complete T/T system. Since the researchers believe this training results in a safer, more effective operator, they recommended 37th TRANSCOM consider adding training on specific vehicle system operation.

3. Instructor qualification criteria: The researchers concluded 37th TRANSCOM should adopt ERTI's minimum driving experience requirement. To eliminate problems created by tour length, they recommended the Army assign qualified personnel to 37th TRANSCOM for immediate duty as instructors and SIDs.

4. Teaching aids: The researchers found ERTI's ability to combine verbal instruction with visual demonstration of truck component operation, through use of its mock-up truck systems, resulted in a significant gap. Believing this training produces a more knowledgeable and effective T/T operator, they recommended 37th TRANSCOM consider acquiring mock-up truck systems for use in it~ training program.

5. Equipment: As a result of training students on the exact model of equipment they will operate, the researchers found 37th TRANSCOM drivers are ready for solo operations

after program completion. Since the researchers identified
this as a significant positive gap, they concluded no change
was necessary.

Although the researchers noted three areas in which
37th TRANSCOM's program could be improved, they believe it
is already a solid program. Finally, they offered their
opinions of viable areas for further research.

Appendix A: The Training Management Cycle
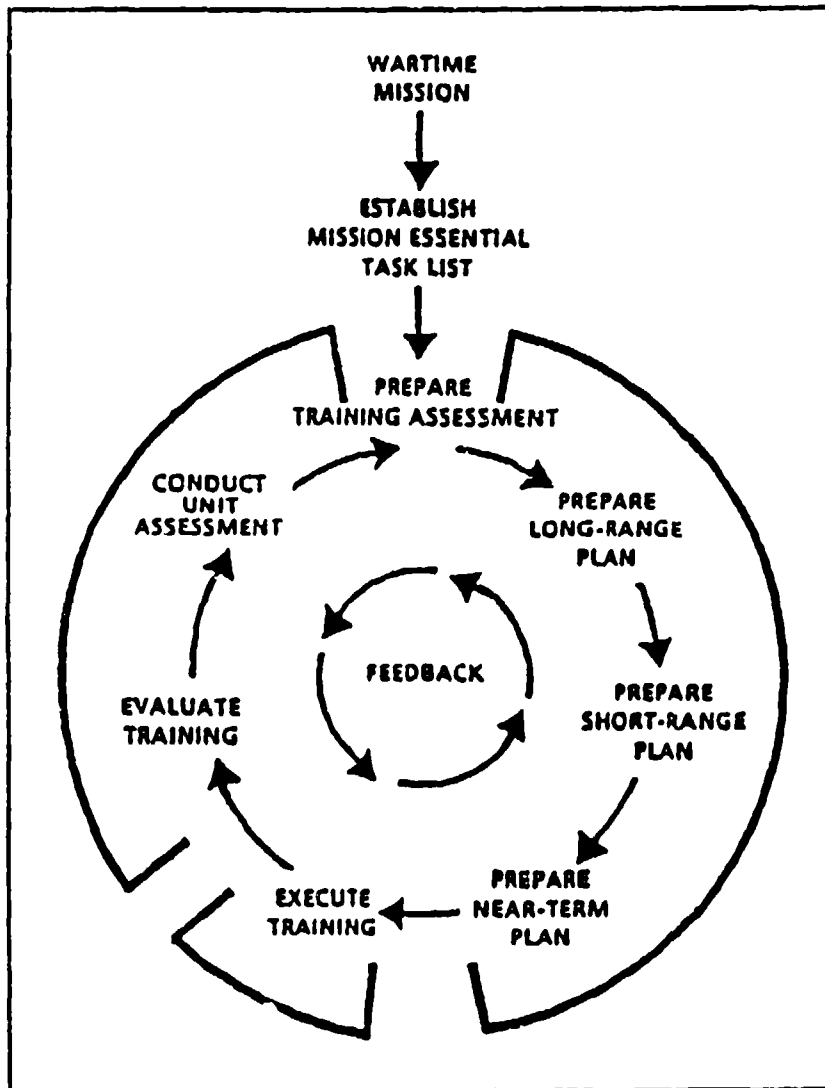
Figure 1: The Training Management Cycle (FM 25-101, 1990:1-11)

Appendix 3: 53d Transportation Battalion Drivers'
Academy Training Schedule

The following schedule is adapted from 53d Transportation
Battalion Drivers' Academy Training Schedule.

TIME	SUBJECT	REFERENCE
DAY 1		
0745-0830	INTRODUCTION	AS DIRECTED
0830-0900	WELCOME TO 37TH TRANSCOM	AS DIRECTED
0900-1000	DRIVING IN EUROPE	VIDEO TAPES
1000-1200	INTERNATIONAL ROAD SIGNS	USAREUR PAM 190-34
1200-1300	LUNCH	
1300-1700	GERMAN LAW	USAREUR PAM 190-34
DAY 2		
0545-0700	PT FORMATION	FM21-20 & AR600-9
0700-0845	PERSONAL HYGIENE	
0845-0900	FORMATION	FM22-5
0900-1200	HAZARDOUS CARGO	USAREUR REG. 190-34/55-4
1200-1300	LUNCH	
1300-1700	HAZARDOUS CARGO	USAREUR REG. 190-34/55-4
DAY 3		
0745-0800	FORMATION	FM22-5
0800-0900	BACKING CLASS	FM21-305 CH6 & 37TH REG. 55-108
0900-1200	M915/M915A1	TM9-2320-273-10WC

TIME	SUBJECT	REFERENCE
1200-1300	LUNCH	
1300-1500	CUCV SERIES	TM9-2320-289-10 & VIDEO TAPE
1500-1600	TEST GERMAN LAW & INTERN'TL R/S	USAREUR PAM 190-34

DAY 4

TIME	SUBJECT	REFERENCE
0545-0700	PT FORMATION	FM21-20 & AR600-9
0700-0845	PERSONAL HYGIENE	
0845-0900	FORMATION	FM22-5
0900-1000	M210 VANS	LOCAL DIRECTIVE
1000-1200	COMMITMENT	37TH REG. 55-108
1200-1300	LUNCH	
1300-1400	TAMMS	DA PAM 738-750
1400-1600	BREAKDOWN & RON PROCEDURES	37TH REG. 55-108
1600-1700	RETEST ON GERMAN LAW AND ROAD SIGNS	USAREUR PAM 190-34

DAY 5

TIME	SUBJECT	REFERENCE
0545-0700	PT FORMATION	FM21-20/AR600-9
0700-0845	PERSONAL HYGIENE	
0845-0900	FORMATION	FM22-5
0900-1100	MAP READING	37TH REG. 55-108 (ROAD ATLAS)
1100-1200	TEST ON M915 & CUCV	TM9-2320-273-1OWC TM9-2320-289-10
1200-1300	LUNCH	

TIME	SUBJECT	REFERENCE
1300-1500	CLASSIFIED & SENSITIVE CARGO	37TH REG. 55-108 USAREUR REG. 55-355
1500-1700	MAIL PROCEDURES	37TH REG. 55-108/ 750-1 & USAREUR REG. 65-1 & DOD 4525.6-M305

DAY 6

0745-0800	FORMATION	FM22-5
0800-1000	ACCIDENT REPORTING	FM21-305 & 37TH REG. 55-108
1000-1200	ALOC/999	37TH REG. 55-108
1200-1300	LUNCH	
1300-1500	BLOCKING & BRACING	USAREUR REG 55-48 37TH REG. 55-108
1500-1600	ROAD SIDE INSPECTIONS	37TH REG. 55-108
1600-1700	MAP TEST	37TH REG. 55-108

DAY 7

0545-0700	PT FORMATION	FM21-20/AR600-9
0700-0845	PERSONAL HYGIENE	
0845-0900	FORMATION	FM22-5
0900-1000	SAFETY OUTLINE	REG. 385-55
1000-1200	FLIGHT LINE SAFETY	RAB REG. 55-4 & FM21-305
1200-1300	LUNCH	
1300-1500	DROPSIDE TRAILER	37TH REG. 55-108
1500-1700	REVIEW FOR FINAL TEST	NOTES & REFERENCES FROM CLASSES

TIME	SUBJECT	REFERENCE
DAY 8		
0745-0800	FORMATION	FM22-5
0800-1200	MAINTENANCE	37TH REG. 55-108 & REG. 750-1
1200-1300	LUNCH	
1300-1600	PMCS	TM9-2320-273-1OWC & TM9-2320-283-10
DAY 9		
0545-0700	PT FORMATION	FM21-20/AR 600-9
0700-0845	PERSONAL HYGIENE	
0845-0900	FORMATION	FM22-5
0900-1000	FINAL TEST	37TH REG. 55-108
1000-1200	DOCUMENTATION	37TH REG. 55-108 & FM 21-305
1200-1300	LUNCH	
1300-1700	DOCUMENTATION	37TH REG. 55-108 & FM 21-305
DAY 10		
0545-0700	PT FORMATION	FM21-20 & AR 600-9
0700-0845	PERSONAL HYGIENE	
0845-0900	FORMATION	FM22-5
0900-1200	FORWARDING/BACKING RANGE	37TH REG. 55-108
1200-1300	LUNCH	
1300-1700	FORWARDING/BACKING RANGE	37TH REG. 55-108

TIME	SUBJECT	REFERENCE
DAY 11		
0745-0800	FORMATION	FM22-5
0800-1200	FORWARDING/BACKING RANGE	37TH REG. 55-108
1200-1300	LUNCH	
1300-1700	FORWARDING/BACKING RANGE	37TH REG. 55-108
DAY 12		
0545-0700	PT FORMATION	FM21-20 & AR600-9
0700-0845	PERSONAL HYGIENE	
0845-0900	FORMATION	FM22-5
0900-1200	FORWARDING/BACKING RANGE	37TH REG. 55-108
1200-1300	LUNCH	
1300-1700	FORWARDING/BACKING RANGE	37TH REG. 55-108
DAY 13		
0745-0800	FORMATION	FM22-5
0800-1200	FORWARDING/BACKING RANGE	37TH REG. 55-108
1200-1300	LUNCH	
1300-1600	FORWARDING/BACKING RANGE	37TH REG. 55-108
DAY 14		
0745-0800	FORMATION	FM22-5
0800-1200	GRADUATION PRACTICE	AS DIRECTED
1200-1300	LUNCH	
1300-1500	GRADUATION CEREMONY	AS DIRECTED

<u>Appendix C: Survey Interview Recording Form</u>

NAME/DATE:_____

COMPANY:_____

POSITION:_____

PHONE #:_____

ADDRESS:_____

1. EXCLUDING YOUR OWN ORGANIZATION'S TRACTOR TRAILER (T/T)
OPERATOR TRAINING PROGRAM, WHICH TRAINING ORGANIZATIONS FROM
ACROSS THE US DO YOU THINK DO THE BEST JOB OF TRAINING T/T
OPERATORS? (THESE MAY BE PRIVATE ORGANIZATIONS OR
UNIVERSITY-CONNECTED PROGRAMS)

2. WHAT MEASURES DO YOU USE TO DETERMINE THOSE
ORGANIZATIONS LISTED IN #1 ABOVE?

Appendix D: Required 37th TRANSCOM Driver Training

The following curriculum of required training for 37TH TRANSCOM's drivers' academy orientation course is adapted from 37th TRANSCOM Regulation 55-108:Appendix D.

# HOURS	SUBJECT	REFERENCE
.5	ACADEMY INTRODUCTION	NCOIC
5	TRAFFIC LAWS	USAREUR REG. 190-34
2	INTRODUCTION TO DRIVING IN EUROPE	VIDEO TAPES
2	ACCIDENT REPORTS	AR 385-40/FM 21-11/37TH REG. 385-10/USAREUR REG. 190-34
2	TAMMS	DA PAM 738-750 UPDATED
2	DOCUMENTATION INCLUDING TCMD'S, TRUCK MANIFESTS	USAREUR REG. 55-4/ FM 55-30/37TH/ TRANSCOM REG. 55-108/ DA PAM 738-750
2	COMMITMENT	37TH REG. 55-108
2	BREAKDOWN AND OVERNIGHT PROCEDURES	37TH 750-1/ 37TH 55-108
1	M210 VANS	OWNER'S MANUAL/ LOCAL DIRECTIVE
2	M915A1	TM-9-2320-283-10 W/CHANGES/ DA PAM 738-750
2	M915	TM-9-2320-273-10 W/CHANGES/ DA PAM 738-750
2	M911 (377 ONLY)	TM-9-2320-270-10 W/CHANGES

# HOURS	SUBJECT	REFERENCE
2	TRAILERS	TM-2330-358-14P/M871
		TM-2330-359-14P/M872
		TM-2330-374-14P/M129A3
		TM-2330-297-14/S209
		TM-8115-202-14/S209
		TM-4110-231-14/S209
		TM-6115-585-12/S209
1	M1008/1009	TM-9-2320-289-10
		W/CHANGES
8	OPERATORS MAINTENANCE	AR 750-1/DA PAM 750-10/
		TM 9-8000/FM 55-30
		W/CHANGES
		37TH TRANSCOM 750-1
		TM-9-2320-270-10
		TM-9-2320-273-10
		TM-9-2320-283-10
1	ROADSIDE SPOT CHECKS	37TH REG. 750-1/
		DA PAM 750-1&10/
		USAREUR 55-4
2	MAP READING	EUROPEAN ROAD ATLAS
1	BLOCKING AND BRACING	FM 21-305/FM 55-30/
		USAREUR REG. 55-48
		TM-9-1300-206
5	VEHICLE SECURITY	37TH 750-1/LOCAL SOP
1	CLASSIFIED AND SENSITIVE CARGO PROCEDURES	37TH REG. 55-108
8	HAZARDOUS CARGO	USAREUR 55-4/GGVS AND THE ADR
4	POL	USAREUR 55-4

Appendix E: Student Driver Tasks

The following student driver tasks are required for 37TH TRANSCOM SID training. The lists are adapted from 37th TRANSCOM Regulation 55-108:Appendix D.

A. **Before Operation Tasks:**

1. Receive and complete operations order.
2. Receive and complete trip ticket (DD Form 1970).
3. Perform before operation PMCS.
4. Check drivers packet for completeness.
5. Check vehicle BII for completeness and serviceability.
6. Identify potential mirror blind spots.
7. Start vehicle according to the existing weather conditions.
8. Warm engine.
9. Perform before operations PMCS inspection on trailer.
10. State the width, height, and weight of load.
11. State the limits of load transport.
12. State the characteristics of the transport vehicle.
13. Plan a truck route on a road map.
14. Determine height on load by using the cargo height sighting device.
15. Determine that load is secure.
16. Check tarp placement and sideboard serviceability.

B. During Operation Tasks:

1. Use seatbelts.
2. Select gear for load.
3. Give proper signals.
4. Make a smooth start.
5. Use trailer brakes properly.
6. Operate the "Jacob's Brake" on the M915 series vehicle.
7. Stop a vehicle in motion properly.
8. Maintain adequate and constant speed.
9. State and execute proper following distance.
10. Cross railroad crossing properly.
11. Prevent creeping or drifting when stopped.
12. Maintain proper speed.
13. Execute turns properly.
14. Start vehicle properly on an upgrade.
15. Back up vehicle properly.
16. Pass properly.

17. Couple semitrailer.
18. Deal with consignee problems.
19. State procedures when cargo is received without paperwork and when paperwork is received without cargo.
20. Perform during operation PMCS on vehicle.
21. Perform during operation inspection on trailer.
22. Utilize a trailer transfer point.
23. React to emergency vehicles.
24. Handle vehicle in cross winds.
25. Properly enter autobahn.
26. Properly exit autobahn.
27. Properly enter traffic circles.
28. Parallel park vehicle.
29. Park vehicle on angle.
30. React to traffic jam.
31. Maintain road courtesies.
32. Transport personnel in military vehicles.
33. Take specified breaks (37th Reg. 55-108)

C. After Operation Tasks:

1. Uncouple semitrailer.
2. Properly shut down vehicle.
3. Perform after operations PMCS on vehicle.

D. Related Tasks:

1. Present proper military appearance.
2. Identify international road signs.
3. Know authorized speed limits.
4. Convert kilometer per hour to miles per hour.
5. Mount tire chains.
6. State information required to report a breakdown.
7. Use autobahn telephones.
8. Change a vehicle tire.
9. Properly use a fire extinguisher.
10. Fill out DD Form 518 (Accident Identification Card).
11. Fill out SF 91 (Operator's Report of Motor Vehicle Accident).
12. Prepare for RON.
13. Read and understand USAF computer printout and TCMD.
14. Fill out customs forms and cross national borders.
15. Use and account for fuel coupons.
16. Determine/perform required services.
17. Be familiar with forms and materials necessary to transport dangerous, hazardous, and/or sensitive cargo.
18. Properly place warning triangles.

Appendix F: ERTI Entrance Requirements
from Code of Federal Regulations 49, Part 91

A portion of the admission requirements of ERTI is meeting the criteria required in *CFR 49,* Part 391 for qualification as a truck driver. The following list of requirements to qualify as a truck driver is adapted from Part 391 of the *CFR 49.*

    1. Is at least 21 years old (upon graduation from ERTI).

    2. Can read and speak the English language sufficiently to converse with the general public, to understand highway traffic signs and signals in the English language, to respond to official inquiries, and to make entries on reports and records.

    3. Is not disqualified to drive a motor vehicle under the rules in part 391.15, Disqualification of Drivers.

    4. Is physically qualified to do so and, except as provided in part 391.67, has on his person the original, or a photographic copy, of a medical examiner's certificate that he is physically qualified to drive a motor vehicle.

    5. Is physically qualified to drive a motor vehicle:

        a. Has no loss of a foot, a leg, a hand, or an arm, or has been granted a waiver pursuant to part 391.49.
        b. Has no impairment of:
        (1) A hand or finger which interferes with prehension or power grasping; or
        (2) An arm, foot, or leg which interferes with the ability to perform normal tasks associated with operating a motor vehicle; or any other significant limb defect or limitation which interferes with the ability to perform normal tasks associated with operating a motor vehicle; or has been granted a waiver pursuant to part 391.49.
        c. Has no established medical history or clinical diagnosis of diabetes mellitus currently requiring insulin for control.
        d. Has no current clinical diagnosis of myocardial infarction, angina pectoris, coronary insufficiency, thrombosis, or any other cardiovascular disease of a variety known to be accompanied by syncope, dyspnea, collapse, or congestive cardiac failure.
        e. Has no established medical history or clinical diagnosis of a respiratory dysfunction likely to interfere

with his ability to control and drive a motor vehicle safely.

f. Has no current clinical diagnosis of high blood pressure likely to interfere with his ability to operate a motor vehicle safely.

g. Has no established medical history or clinical diagnosis of rheumatic, arthritic, orthopedic, muscular, neuromuscular, or vascular disease which interferes with his ability to control and operate a motor vehicle safely.

h. Has no established medical history or clinical diagnosis of epilepsy or any other condition which is likely to cause loss of consciousness or any loss of ability to control a motor vehicle.

i. Has no mental, nervous, organic, or functional disease or psychiatric disorder likely to interfere with his ability to drive a motor vehicle safely.

j. Has distant visual acuity of at least 20/40 (Snellen) in each eye without corrective lenses or visual acuity separately corrected to 20/40 (Snellen) or better with corrective lenses, distant binocular acuity of at least 20/40 (Snellen) in both eyes with or without corrective lenses, field of vision of at least 70 degrees in the horizontal Meridian in each eye, and the ability to recognize the colors of traffic signals and devices showing standard red, green, and amber.

k. First perceives a forced whispered voice in the better ear at not less than 5 feet with or without the use of a hearing aid or, if tested by use of an audiometric device, does not have an average hearing loss in the better ear greater than 40 decibels at 500 Hz, 1,000 Hz, and 2,000 Hz with or without a hearing aid when the audiometric device is calibrated to American National Standard (formerly ASA Standard) Z24.5-1951.

l. Does not use a Schedule I drug or other substance identified in appendix D to this subchapter, an amphetamine, a narcotic, or any other habit-forming drug, except that a driver may use such a substance or drug if the substance or drug is prescribed by a licensed medical practitioner who is familiar with the driver's medical history and assigned duties and who has advised the driver that the prescribed substance or drug will not adversely affect the driver's ability to safely operate a motor vehicle.

m. Has no current clinical diagnosis of alcoholism.

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Appendix G: ERTI T/T Operator Training Program

The following outline of ERTI's T/T operator training program is adapted from ERTI's *Professional Truck Driving Course* company brochure listed in the Bibliography.

SECTION I - BASIC OPERATION

A. UNIT 1.1 - ORIENTATION

1. Overview of Motor Transportation Certificate Program Content

   a. Basic Operations
   b. Safe and Advanced Operating Practices
   c. Vehicle Maintenance
   d. Non-Vehicle Activities

2. Duties and Responsibilities of the Professional Driver

   a. Lifestyle
   b. Personal appearance
   c. Public relations
   d. Trip planning and scheduling
   e. Responsible for on-time pickup and delivery
   f. Supervises loading and unloading
   g. Responsible for proper load distribution
   h. Freight loss and damage prevention
   i. Responsible for vehicle and freight security
   j. Maintains contact with shippers, receivers and dispatchers
   k. Applies proper safety procedures at all times
   l. Maintains complete and up-to-date knowledge of federal, state and local motor carrier safety and licensing regulations
   m. Maintains records: permit books, licenses, fuel and special permits, log books
   n. Completes forms and reports: inspection reports, trip reports, bills of lading, freight manifests

B. HISTORICAL BACKGROUND - ORIENTATION

1. The Interstate Commerce Act of 1887

   - Established Interstate Commerce Commission

2. The Transportation Act of 1920

- Strengthened ICC railroad regulating powers

3. The Motor Carrier Act of 1935

   - ICC motor carrier regulation authority

4. The Interstate Commerce Act of 1942

   - ICC freight forwarders regulation authority

5. Department of Transportation (Established 1966)

   a. Federal Highway Administration
   b. Bureau of Motor Carrier Safety
   c. National Highway Traffic Safety Administration

6. Motor Carrier Act of 1980

   - Deregulation

7. Surface Transportation Assistance Act of 1982

   a. Designated federal highways
   b. Standardized vehicle size and weight
   c. Increased minimum insurance standards

8. Motor Carrier Safety Act of 1984

   a. Tandem Truck Safety Act of 1984 (House Bill)
   b. Reasonable access
   c. Splash and spray suppression
   d. Increased minimum insurance standards
   e. New safety standards

9. National Commercial Driver License Program
   (1986)

   a. Single Operators License (1987)
   b. Reporting
   c. Minimum Standards for Testing & Fitness (1988)
   d. Minimum Uniform Standards
   e. Information Clearing House (1989)
   f. National Standard Blood Alcohol Level (1992)

C. COMPANY ORGANIZATION AND FREIGHT MOVEMENT - ORIENTATION

   1. Motor Transportation Company Infrastructures

      a. Management
      b. Corporate personnel-drivers' personnel and
         recruiting
      c. Sales
      d. Payroll, accounting

e. Dock operations, shipping and receiving
f. Dispatch, drivers
g. Licensing and permits department
h. Safety, insurance and risk management
i. Maintenance

2. Types of Motor Transportation Companies

   a. Common carrier
   b. Contract carrier
   c. Private carrier

3. Classification of Freight

   a. Regulated freight
   b. Exempt freight
   c. TL (truckload)

4. Freight Movement Shipper to Receiver

   a. Door-to-door, direct pickup and delivery
   b. Local pickup, terminal-to-terminal line-haul, local delivery
   c. Local pickup, trailer-to-railcar (intermodal) line-haul, local delivery

5. Future Trends in Motor Transportation

   a. Intermodalism
   b. Electronics
   c. Communications
   d. Education

D. UNIT 1.2 - CONTROL SYSTEMS

1. Primary Systems

   a. Steering
   b. Acceleration
   c. Shifting
   d. Braking
   e. Parking

2. Secondary Systems

   a. Lights
   b. Signals
   c. Windshield wipers and washers
   d. Interior climate
   e. Two-way radios

E. UNIT 1.3 - VEHICLE INSPECTIONS

   1. Approaching the Vehicle

       a. Posture
       b. Cargo
       c. Damage
       d. Leaks

   2. Under Hood

       a. Fluid levels
       b. Leaks
       c. Electrical system
       d. Belts and pulleys
       e. Coolant system
       f. Steering system
       g. Braking system
       h. Suspension system
       i. Exhaust system
       j. Hood security

   3. In the Cab

       a. Entry
       b. Emergency and safety equipment
       c. Mirrors and glass
       d. Engine start-up
       e. Instruments and gauges
       f. Steering
       g. Clutch
       h. Transmission
       i. Accelerator
       j. Brake pedal
       k. Other controls
       l. Cab housekeeping

   4. Walk Around Inspection

       a. Wheels and rims
       b. Tire pressure
       c. Tire condition
       d. Dual tires
       e. Trailer coupling
       f. Brake system
       g. Fuel system
       h. Lights and reflectors
       i. Suspension system
       j. Cargo security

F. UNIT 1.4 - 1.7 - BASIC CONTROL

   1. Engine

a. Start-up
b. Warm-up
c. Shut-down

2. Shifting

   a. Clutch use
   b. Upshifting
   c. Downshifting
   d. Conventional transmission types
   e. Auxiliary transmission types
   f. Multi-speed axles
   g. Automatic and semi-automatic transmissions

3. Vehicle Positioning

   a. Straight line
   b. Turning
   c. Forward and reverse

4. Coupling and Uncoupling - Alignment

   a. Tractor
   b. Trailer

5. Inspection

   a. Trailer movement
   b. Loaded or unloaded
   c. Condition
   d. Surface and support

6. Coupling

   a. Backing
   b. Air supply
   c. King pin and fifth wheel assemblies
   d. Electrical connections
   e. Landing gear
   f. Testing

7. Uncoupling

   a. Site selection and surface
   b. Air and electrical connections
   c. Landing gear
   d. King pin and fifth wheel
   e. Pulling forward

8. Putting the Vehicle in Motion - Forward

   a. Smooth acceleration
   b. Upshifting

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      c. Downshifting
      d. Straight line
      e. Normal turns
      f. Off tracking
      g. Sharp turns
      h. Serpentine
      i. Offset alley
      j. Tracking
      k. Lateral and vertical clearance

9. Backward

      a. Using mirrors
      b. Opposite steering
      c. Observer or pre-inspection
      d. Smooth acceleration
      e. Straight line
      f. Turns
      g. Off tracking
      h. Lateral and vertical clearance
      i. Alley docking
      j. Serpentine
      k. Parallel parking
      l. Down slope docking
      m. Jack-knife parking and docking

G. UNIT 1.8 - PROFICIENCY DEVELOPMENT - BASIC CONTROL

H. UNIT 1.9 - SPECIAL RIGS

1. Instability

      a. Swinging loads
      b. Sloshing loads
      c. High center of gravity

2. Reduced Clearance

      a. Sides
      b. Top
      c. Bottom

3. Reduced Rate of Acceleration/Deceleration

4. Characteristic That Creates a High Accident Risk

I. DEPARTMENT OF TRANSPORTATION MOTOR CARRIER SAFETY REGULATIONS

1. Parts 390 Federal Motor Carrier Safety Regulation - General

      a. Subpart a - Definitions

b. Subpart b - General

2. Part 391 Qualification of Drivers

    a. Subpart a - General
    b. Subpart b - Qualification and disqualification of drivers
    c. Subpart c - Background and character
    d. Subpart d - Examinations and tests
    e. Subpart e - Physical qualifications and examinations
    f. Subpart f - Files and records
    g. Subpart g - Limited exemptions

3. Part 392 Driving of Motor Vehicles

    a. Subpart a - General
    b. Subpart b - Driving of vehicles
    c. Subpart c - Stopped vehicles
    d. Subpart d - Use of lighted lamps and reflectors
    e. Subpart e - Accidents and license revocation, duties of drivers
    f. Subpart f - Fueling precautions
    g. Subpart g - Prohibited practices

4. Part 393 Parts and Accessories Necessary for Safe Operation

    a. Subpart a - General
    b. Subpart b - Lighting devices, reflectors and electrical equipment
    c. Subpart c - Brakes
    d. Subpart d - Glazing and window construction
    e. Subpart e - Fuel systems
    f. Subpart f - Coupling devices and towing methods
    g. Subpart g - Miscellaneous parts and accessories

SECTION II

A. SAFE OPERATING PRACTICES

1. Unit 2.1 - Visual Search

    a. Lead time
    b. Lateral scan
    c. Mirrors
    d. Instrument panel
    e. Turns and curves
    f. Timing

2. Unit 2.2 - Communications

    a. Directional signals

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b. Timing and cancelling signals
    c. Brake lights
    d. Four-way flashers
    e. Headlights
    f. Vehicle position
    g. Horns
    h. Two-way radios

3. Unit 2.3 – Speed Management

    a. Stopping distance
    b. Hydroplaning
    c. Maneuverability
    d. Fuel economy
    e. Vehicle weight, center of gravity
    f. Curves and turns
    g. Sight distance
    h. Road surface conditions

4. Unit 2.4 – Space Management

    a. Traffic
    b. Sides
    c. Rear
    d. Following
    e. Passing
    f. Turning
    g. Disabled vehicle
    h. Lateral clearance
    i. Overhead clearance

5. Unit 2.5 – Night Operations

    a. Speed
    b. Lights
    c. Night vision
    d. Auxiliary lighting
    e. Fatigue

6. Unit 2.6 – Extreme Driving Conditions

    a. Cold weather
    b. Hot weather
    c. Stormy conditions
    d. Snow and ice
    e. Mountains

7. Unit 2.7 – Proficiency Development Practice
    relative to all objectives in this unit

B. ADVANCED OPERATING PRACTICES

1. Unit 3.1 – Hazard Perception

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a. Road conditions
        b. Other road users
        c. Miscellaneous hazards

    2. Unit 3.2 - Emergency Maneuvers

        a. Stopping directional control - dry surface
        b. Evasive maneuvers - dry surface
        c. Brake failure
        d. Leaving the roadway
        e. Blowouts

    3. Unit 3.3 - Skid Control and Recovery

        a. Directional control - slick surface
        b. Stopping - slick surface
        c. Recovery - tractor skids
        d. Recovery - trailer skids

C. DEFENSIVE DRIVING

    1. Transactional Analysis

        a. Supportive or punishing parent
        b. Carefree or rebellious child
        c. Problem-solving adult

    2. Smith System

        a. Isolating space
        b. Stabilizing speed

D. DRIVER ENERGY CONSERVATION AWARENESS TRAINING (DECAT)

    1. Aerodynamics

        a. Air resistance
        b. Drag reducing devices

    2. Rolling Resistance

        a. Tires
        b. Wheels and rims
        c. Road surfaces

    3. Power Train

        a. Engine
        b. Engine accessories
        c. Transmission
        d. Axle ratios
        e. Control and monitoring devices

4. Vehicle Maintenance

   a. Air cleaners and filters
   b. Exhaust system
   c. Tune-ups
   d. Tire pressure
   e. Wheels
   f. Oil, fuel additives and lubricants

5. Driving Practices

   a. Speed management
   b. Idling
   c. Skip shifting
   d. Training

6. Operational Techniques

   a. Freight loading and unloading
   b. Dispatching
   c. Double and triple trail
   d. Containerization
   e. Routing
   f. Terminals

SECTION III

A. UNIT 4.1 - VEHICLE SYSTEMS

   1. Engines

      a. Basic operations of the internal combustion
         engines
      b. Differences between gasoline and diesel engines
      c. Two-stroke versus four-stroke engines
      d. Diesel engine types and manufacturers

   2. Engine Auxiliary Systems

      a. Fuel systems
      b. Intake and exhaust systems
      c. Cooling system
      d. Engine brakes

   3. Brakes and Wheels

      a. Hydraulic brakes
      b. Air brakes
      c. Anti-skid/anti-lock brake systems
      d. Spoke wheel system
      e. Disc wheel system
      f. Tires and bearings

4. Drive Trains

   a. Transmission operation
   b. Transmission types
   c. Clutch components
   d. Clutch operation
   e. Clutch brake
   f. Drive shaft(s)
   g. U-joints
   h. Differentials
   i. Axles
   j. Power dividers

5. Coupling Systems

   a. Fifth wheels
   b. Eye hooks and balls
   c. Tractor and trailer
   d. Truck and trailer
   e. Truck and pup
   f. Tractor and set of trailers
   g. Safety cables

6. Suspension

   a. Shock absorbers
   b. Spring
   c. Air ride
   d. Torsion bar
   e. Mixed and miscellaneous

7. Steering

   a. Components
   b. Standard
   c. Rack and pinion
   d. Centerpoint
   e. Power assisted
   f. Tires

8. Electrical Systems

   a. Tractor electrics
   b. Trailer electrics
   c. Electric couplings between combinations

9. Miscellaneous

   a. Frame
   b. Cabs
   c. Dollies
   d. Converta-gear

B. UNIT 4.2 - PREVENTIVE MAINTENANCE AND SERVICING

1. Fuel

   a. Types and uses
   b. Additives

2. Oil

   a. Types and uses
   b. Oil changes
   c. Additives

3. Coolant

   a. Water
   b. Anti-freeze
   c. Additives

4. Battery

   a. Levels
   b. Charging
   c. Cables

5. Filters

   a. Types and uses
   b. Filter changes

6. Lubrication

   a. Chassis
   b. Wheel bearings
   c. Fifth wheel
   d. Electrical connections

7. Tires and Wheels

   a. Air pressure
   b Condition
   c. Change wheels (tires mounted)
   d. Mounting tires

8. Air Supply System

   a. Tanks
   b. Lines
   c. Couplings
   d. Moisture

9. Brakes

    a. Checking clearances and condition
    b. Brake adjustment

10. Lights

    a. Replacing
    b. Repairing

11. Fuses and Circuit Breakers

    a. Testing
    b. Replacing and resetting

C. UNIT 4.3 - DIAGNOSING AND REPORTING MALFUNCTIONS

1. Critical Item Inspections

    a. Wheels and tires
    b. Steering mechanism
    c. Suspension
    d. Brakes
    e. Air system
    f. Drawbar systems
    g. Fifth wheels
    h. Brake lights
    i. Turn signals

2. Instruments

    a. Speedometer
    b. Tachometer
    c. Tachograph
    d. Oil pressure gauge
    e. Engine oil temperature gauge
    f. Water temperature gauge
    g. Pyrometer
    h. Ammeter
    i. Voltmeter
    j. Transmission temperature gauge
    k. Rear end temperature gauges(s)
    l. Air pressure gauge
    m. Application air pressure gauge
    n. Audible alarm
    o. Air Pressure flag

3. Reporting Malfunctions

    a. Pre-trip inspections
    b. Post-trip inspections
    c. Terminology

d.   Written communications
        e.   Oral communication

    4. Miscellaneous

        a.   Vehicle operation characteristics
        b.   Sight
        c.   Sound
        d.   Feel
        e.   Smell

SECTION IV - NON-TRUCK ACTIVITIES

A. UNIT 5.1 - HANDLING CARGO

    1. Cargo Handling Equipment

        a.   Pallets
        b.   Jacks
        c.   Dollies
        d.   Hand trucks
        e.   Forklift trucks
        f.   Nets
        g.   Slings
        h.   Cherry pickers
        i.   Cranes
        j.   Miscellaneous

    2. Loading Cargo

        a.   Weight distribution
        b.   Vans
        c.   Flatbeds
        d.   Drop decks
        e.   Tankers
        f.   Specialized trailers

    3. Securing Cargo

        a.   Blocking, bracing, packing and stacking
        b.   Straps, winches, rope, cable, chains and chain
             binders
        c.   Appropriate knots
        d.   Tarps and tarping

    4. Unloading Cargo

        a.   Vans
        b.   Flatbeds
        c.   Tankers
        d.   Specialized equipment

B. **UNIT 5.2 – CARGO DOCUMENTATION**

1. General – Purpose and use

2. Uniform Straight Bill of Lading

3. Short Form Bill of Lading

4. Uniform Order Bill of Lading

5. Uniform Livestock Contract

6. Government Bill of Lading and Converting to a Government Bill of Lading

7. Miscellaneous

   a. Collect shipments
   b. Prepaid shipments
   c. Split pickups or deliveries
   d. Stops in transit
   e. Special instructions
   f. Handling overages, shortages and damaged shipments
   g. Part lot shipments
   h. Advanced charges
   i. Released valuation
   j. Shipment without recourse

8. Preparation of Bills of Lading

9. Uniform Hazardous Materials Manifest

10. Uniform Hazardous Waste Manifest

11. Part 397 Transportation of Hazardous Materials, Driving and Parking Rules

    a. Sec. 1 – Application of the rules in this part
    b. Sec. 2 – Compliance with Federal Motor Carrier Safety Regulations
    c. Sec. 3 – State and local laws, ordinances and regulations
    d. Sec. 5 – Attendance and surveillance of motor vehicles
    e. Sec. 7 – Parking
    f. Sec. 9 – Routes
    g. Sec. 11 – Fires
    h. Sec. 13 – Smoking
    i. Sec. 15 – Fueling
    j. Sec. 17 – Tires
    k. Sec. 19 – Instruction and documents

1. Sec. 21 - Marking of vehicles operated by private carriers

C. UNIT 5.3 - HOURS OF SERVICE REQUIREMENTS

    1. Part 395 - Hours of Service of Driver(s)

        a. Sec. 1 - Compliance with and knowledge of the rules of this part
        b. Sec. 2 - Definitions
        c. Sec. 3 - Maximum driving and on-duty time
        d. Sec. 7 - Travel time
        e. Sec. 8 - Driver's daily log
        f. Sec. 9 - Driver's multi-day log
        g. Sec. 10 - Adverse driving conditions
        h. Sec. 11 - Emergency conditions
        i. Sec. 12 - Relief from regulations
        j. Sec. 13 - Drivers declared out of service

D. UNIT 5.4 - ACCIDENT PROCEDURES

    1. Part 394 - Notification, Reporting and Recording of Accidents

        a. Sec. 1 - Scope of rules
        b. Sec. 3 - Definition of "reportable accident"
        c. Sec. 5 - Definition of "farm to market agricultural transportation"
        d. Sec. 7 - Immediate notification of fatal accidents
        e. Sec. 9 - Reporting of accidents
        f. Sec. 11 - Notice of death after filing report
        g. Sec. 13 - Accident register
        h. Sec. 15 - Assistance in investigation and special studies
        i. Sec. 20 - Instructions for preparing accident reports

E. UNIT 5.5 - TRIP PLANNING

    1. Federal, State and Local Requirements

        a. Licenses and permits
        b. Vehicle size and weight (bridge laws)
        c. Cargo size and weight (over-dimensional)
        d. Cargo documentation
        e. Interchanges

    2. Maps

        a. General
        b. Using indexes
        c. Using legends

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          d. Coordinates
          e. Time changes and zones
          f. Mile markers (location and direction)
          g. Routing: Terrain, weather, cost efficiency, ETA, special instructions

    3. Trip Reports

          a. I.D. numbers
          b. Route numbers
          c. Receipts: fuel, reimbursed costs, personal income tax
          d. Mileage: state line, midnight, stop off and drop, trip totals
          e. Shippers' and receivers' addresses

F. UNIT 5.6 - PERSONAL HEALTH AND SAFETY

    1. Health maintenance

    2. Diet

    3. Exercise

    4. Fatigue

    5. Alcohol and drugs

    6. Clothing

    7. Seat belts

    8. Industrial safety

    9. Non-driving safety hazards

    10. Robberies, hijacking and pilferage

G. UNIT 5.7 - PUBLIC AND EMPLOYER RELATIONS

    1. Public Relations

          a. Image
          b. Trucking industry
          c. Public
          d. Customers
          e. Employer
          f. Other - highway users

    2. Self-Directed Job Search

          a. Networking
          b. Resumes

c. Cover letters
        d. Applications
        e. Interviews
        f. Appearance
        g. Follow-up

3. Verbal Communications

        a. Research
        b. Listening skills
        c. One-on-one
        d. Small group discussions
        e. Clarity and accuracy
        f. Telephones

4. Written Communications

        a. Research
        b. Reading
        c. Clarity and accuracy
        d. Grammar and punctuation

5. Job Survival

        a. Employer
        b. Fellow employees
        c. Customers
        d. Appearance
        e. Punctuality

6. Career Development

7. Continuing Education - Degrees

        a. A.A.
        b. BS/BA
        c. Non-traditional and correspondence
        d. Graduate degree

Appendix H: ERTI Instructor Qualification Requirements

The following list of qualification requirements for ERTI
instructors is adapted from Professional Truck Driver
Institute of America criteria contained in its *Certificate
for Voluntary Certification of Tractor-Trailer Driver
Training Courses and Curriculum*.

Classroom Instruction

Each instructor must have a minimum of:

1.   Two years college-level teacher preparation, or

2.   Two years of vocational education teaching
experience, or

3.   Six credit hours of teaching methods
instruction, or

4.   One-hundred hours of in-service instructor
preparation in tractor-trailer driver training.

Behind-The-Wheel Instruction

The behind-the-wheel instructor must:

1.   Possess a minimum of two years of
tractor-trailer driving experience with an excellent safety
record.

2.   Meet minimum licensing requirements for
tractor-trailer driving in the state in which the school,
organization, or course operates.

3.   Meet the physical requirements for drivers as
specified in Part 391 of the Federal Motor Carrier Safety
Regulations.

4.   Possess proficiency in vehicle handling and
perceptual skills to administer behind-the-wheel instruction
demonstrations effectively.

5.   Have demonstrated knowledge of the principles
and practices of safe driving and of all the laws and
regulations covering tractor-trailer and commercial vehicle
operation.

In-Service Training

One hundred hours of in-service instructor preparation in tractor-trailer driver training may be used to fulfill the instructor qualification requirements. To serve as acceptable substitutes for formal instructor preparation, the in-service training must meet the following conditions:

1. The program must occur in tractor-trailer driver training and not other related subject matters such as emergency medical vehicle services, dispatching, fleet management, and fleet operations.

2. The in-service experience must be tailored to the teaching of a tractor-trailer driver training curriculum, meeting PTDIA criteria.

3. The in-service program should be designed to develop instructor skills. Regular in-service programs that are offered for maintenance of instructor skills should not be substituted for the initial 100 hours of specific preparation in instructional methods.

The in-service requirements may be met through several alternatives including (1) selecting individuals for instructors who have already had an opportunity to participate in the in-service program, (2) by training the individual, prior to employment or soon after employment to qualify the person, or (3) having individuals serve as assistant instructors and providing them the 100 hours of in-service training throughout the first several mouths of employment.

In-service work experience in education programs also may be substituted for the formal educational experience. Teaching experience in vocational education appears to be the most appropriate work education experience to consider in lieu of formal education. Two years of work experience in vocational education provides acceptable evidence of teaching ability.

Driving Ability

Driving ability consists of knowledge, skill, and actual performance. The instructor's ability should far exceed ability identified in the objectives of the curriculum; at a minimum, instructors must have a foundation in the knowledge and skills taught by the course.

Candidates for an instructor position may show a lack of understanding of the subject matter (e.g., operation of diesel engines, safe operating practices, diagnosis of

malfunctions, etc.) or they may be deficient in specific skills or performances. For example, an over-the-road driver may not be able to perform tight quarter maneuvers very well, e.g., backing, docking, etc. Some candidates may not be able to handle skill areas such as skid recovery.

One or two specific areas of weakness would not necessarily rule candidates out as an instructor. However, if they are deficient in several areas, in-service training may be required to bring their ability to an acceptable level.

Teaching Ability

Candidates for an instructor position should be able to teach by employing the methods called for in the curriculum. The curriculum requires effective utilization of classroom, range, street, observation, and demonstration methods. While candidates would not be expected to know specific characteristics of methods employed in lessons of the curriculum, they should have knowledge of the role and function of each. As a minimum, the candidate should have a knowledge of and appreciation of what each method contributes to the student's overall acquisition of the course objectives.

To assure effective communication of information, the instructor must be able to make a clear and concise presentation from the lesson plans. Classroom instruction also make considerable use of problem-solving exercises and instructors are encouraged to interact with students in developing concepts and principles. The ability to conduct highly interactive instruction requires a cordial and patient personality and sufficient depth of understanding to field student questions effectively.

The following table of contents was adapted from the table
of contents appearing in *Bumper to Bumper: The Complete
Guide to Tractor-Trailer Operations.*

Appendix J: Knowledge and Driving Skills
Required by *Code of Federal Regulations 49*, Part 383

The following list of minimum knowledge and driving skills required for CDL qualification are adapted from *CFR 49*.

Required Knowledge

1. Safe operations regulations. Driver-related elements of the regulations contained in *CFR 49*, parts 391, 392, 393, 395, 396, and 397, such as motor vehicle inspection, repair, and maintenance requirements; procedures for safe vehicle operations; the effects of fatigue, poor vision, hearing, and general health upon safe commercial motor vehicle operation; the types of motor vehicles and cargoes subject to the requirements; and the effects of alcohol and drug use upon safe commercial motor vehicle operations.

2. Commercial motor vehicle safety control systems. Proper use of the motor vehicle's safety system, including lights, horns, side and rear-view mirrors, proper mirror adjustments, fire extinguishers, symptoms of improper operation revealed through instruments, motor vehicle operation characteristics, and diagnosing malfunctions. Commercial motor vehicle drivers shall have knowledge on the correct procedures needed to use these safety systems in an emergency situation, e.g., skids and loss of brakes.

3. Safe vehicle control.

   a. Control systems. The purpose and function of the controls and instruments commonly found on commercial motor vehicles.
   b. Basic control. The proper procedures for performing various basic maneuvers.
   c. Shifting. The basic shifting rules and terms, as well as shift patterns and procedures for common transmissions.
   d. Backing. The procedures and rules for various backing maneuvers.
   e. Visual search. The importance of proper visual search, and proper visual search methods.
   f. Communication. The principles and procedures for proper communications and the hazards of failure to signal properly.
   g. Speed Management. The importance of understanding the effects of speed.

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h. Space management. The procedures and techniques for controlling the space around the vehicle.

i. Night operation. Preparations and procedures for night driving.

j. Extreme driving conditions. The basic information on operating in extreme driving conditions and the hazards that are encountered in extreme conditions.

k. Hazard perceptions. The basic information on hazard perception and clues for recognition of hazards.

l. Emergency maneuvers. The basic information concerning when and how to make emergency maneuvers.

m. Skid control and recovery. The information on the causes and major types of skids, as well as the procedures for recovering from skids.

4. Relationship of cargo to vehicle control. The principles and procedures for the proper handling of cargo.

5. Vehicle inspections. The objectives and proper procedures for performing vehicle safety inspections, as follows:

a. The importance of periodic inspection and repair to vehicle safety.

b. The effect of undiscovered malfunctions upon safety.

c. What safety-related parts to look for when inspecting vehicles.

d. Pre-trip/en route/post-trip inspection procedures.

e. Reporting findings.

6. Hazardous materials knowledge, such as what constitutes hazardous material requiring an endorsement to transport; classes of hazardous materials; labeling/placarding requirements; and the need for specialized training as a prerequisite to receiving the endorsement and transporting hazardous cargoes.

7. Air brake knowledge as follows:

a. Air brake system nomenclature.

b. The dangers of contaminated air supply.

c. Implications of severed or disconnected air lines between the power unit and the trailer(s).

d. Implications of low air pressure readings.

e. Procedures to conduct safe and accurate pre-trip inspections.

f. Procedures for conducting en route and post-trip inspections of air actuated brake systems, including ability to detect defects which may cause the system to fail.

8. Operators for the combination vehicle group shall also have knowledge of:

a. Coupling and uncoupling. The procedures for proper coupling and uncoupling a tractor to semi-trailer.

b. Vehicle inspection. The objectives and proper procedures that are unique for performing vehicle safety inspections on combination vehicles.

Required Skills

1. Basic vehicle control skills. All applicants for a CDL must possess and demonstrate basic motor vehicle control skills for each vehicle group which the driver operates or expects to operate. These skills should include the ability to start, to stop, and to move the vehicle forward and backward in a safe manner.

2. Safe driving skills. All applicants for a CDL must possess and demonstrate the safe driving skills for their vehicle group. These skills should include proper visual search methods, appropriate use of signals, speed control for weather and traffic conditions, and ability to position the motor vehicle correctly when changing lanes or turning.

3. Air brake skills. Except as provided in part 393.95, all applicants shall demonstrate the following skills with respect to inspection and operation of air brakes:

a. Pre-trip inspection skills. Applicants shall demonstrate the skills necessary to conduct a pre-trip inspection which includes the ability to:
(1) Locate and verbally identify air brake operating controls and monitoring devices;
(2) Determine the motor vehicle's brake system condition for proper adjustments and that air system connections between motor vehicles have been properly made and secured;
(3) Inspect the low pressure warning device(s) to ensure that they will activate in emergency situations;
(4) Ascertain, with the engine running, that the system maintains an adequate supply of compressed air;
(5) Determine that required minimum air pressure build up time is within acceptable limits and that required alarms and emergency devices automatically deactivate at the proper pressure level; and
(6) Operationally check the brake system for proper performance.

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b. Driving skills. Applicants shall successfully complete the skills tests contained in part 383.113 in a representative vehicle equipped with air brakes.

4. Test area. Skills tests shall be conducted in on-street conditions or under a combination of on-street and off-street conditions.

5. Simulation technology. A state may utilize simulators to perform skills testing, but under no circumstances as a substitute for the required testing in on-street conditions.

Appendix K: Detailed Course Content Comparison

The following comparison table is adapted from information in 37th TRANSCOM Reg. 55-108 and the *Professional Truck Driving Course* as listed in the Bibliography.

TABLE 9

DETAILED COURSE CONTENT COMPARISON

Content	37th (hours)	ERTI (hours)	Gap (hours)
Classroom:			
Documentation:			
- Accident reports	2	13.75	- 11.75
- Shipping documents	2	3.75	- 1.75
Hazardous/sensitive cargo:			
- POL	4	1	+ 3
- Hazardous	8	1	+ 7
- Classified/sensitive	1	0	+ 1
Specific vehicle operations:			
- T/T operations	8	27	- 19
- Vehicle inspections	0	2	- 2
Maintenance:			
- Operator	8	8.75	- .75
- Paperwork	2	4	- 2
Commitment:			
- Procedures	2	0	+ 2
- Breakdown and overnight	2	0	+ 2
- Roadside spot checks	1	0	+ 1
- Map reading	2	2	0
- Vehicle security	.5	0	+ .5
- Blocking and bracing	1	2.5	- 1.5
Other:			
- Orientation	.5	3.25	- 2.75
- Regulations	0	20	- 20
- Energy conservation	0	10	- 10
- Handling cargo	0	6.5	- 6.5
- Hours of service requirement	0	5.75	- 5.75
- Trip planning	0	2.75	- 2.75
- Personal health and safety	0	5	- 5
- Public and employer relations	0	4.25	- 4.25

Detailed Course Content Comparison
(Continued)

Content	37th (hours)	ERTI (hours)	Gap (hours)
Lab:			
Specific vehicle operations:			
- Vehicle inspections			
- T/T operations	0	4	- 4
Maintenance:	0	55	- 55
- Operator			
Other:	0	16.5	- 16.5
- Orientation			
- Public/employer relations	0	1	- 1
	0	32.5	- 32.5
Range:			
Specific vehicle operations:			
- T/T operations	40	26.5	+ 13.5
Shotgun:	40	0	+ 40
Behind-the-wheel experience:	200	28.75	+171.25

(37th TRANSCOM Reg. 55-108, 1991:Appendix D; *Professional
Truck Driving Course*, undated:7-21)

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13. ABSTRACT (Maximum 200 words) The purpose of this research was to determine differences between the Army's 37th Transportation Command (TRANSCOM) tractor trailer (T/T) driver training program and a selected civilian industry leader's training program in order to identify practices which could improve 37th TRANSCOM's training program. In order to make this comparison, the researchers used a benchmarking methodology to compare T/T training programs of 37th TRANSCOM and Eaton Roadranger Training Institute. Major findings were identified in five areas. There were negative gaps in the four benchmark areas of minimum age requirement, course content, prior driving experience required of instructors, and mock-up training aids. One positive gap was identified in equipment on which students are trained. The researchers concluded 37th TRANSCOM has a solid program already, but could benefit from three changes. Requiring personnel to gain two years of driving experience before becoming instructors would provide better instructors, in the researchers' opinion. Additionally, the researchers concluded 37th TRANSCOM could produce a more effective tractor trailer operator by including instruction on specific vehicle operations, and by using mock-up truck systems to enhance verbal instruction.

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