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1944

TM 21-301

WAR DEPARTMENT TECHNICAL MANUAL

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DRIVER SELECTION, TRAINING, AND SUPERVISION, HALF-TRACK AND FULL-TRACK VEHICLES

WAR DEPARTMENT • 18 OCTOBER 1944

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WAR DEPARTMENT TECHNICAL MANUAL

TM 21-301

DRIVER SELECTION, TRAINING, AND SUPERVISION, HALF-TRACK AND FULL-TRACK VEHICLES

WAR DEPARTMENT • 18 OCTOBER 1944

United States Government Printing Office
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WAR DEPARTMENT,
WASHINGTON 25, D. C., 18 October 1944.

TM 21–301, Driver Selection, Training, and Supervision, Half-Track and Full-Track Vehicles, is published for the information and guidance of all concerned.

[A. G. 300.7 (15 Sep 44).]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

J. A. ULIO,
Major General,
The Adjutant General.

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TECHNICAL MANUAL

DRIVER SELECTION, TRAINING, AND SUPERVISION, HALF-TRACK AND FULL-TRACK VEHICLES

CHANGES No. 1

DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., *28 October ~~1949~~.*

TM 21-301, 18 October 1944, is changed as follows:

4. General Nature of Problem of Selection, Training and Supervision of Drivers

a. Selecting, training, examining * * * steps are followed. Vehicle operators' permits are issued only to individuals who have passed satisfactorily examinations conducted by a qualified commissioned officer as specified in DA AGO PRT 565 (Manual—Examination of Motor Vehicle Operators). This manual covers * * * of the drivers.

* * * * * * *

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7. Planning and Organizing the Course

a. The plan for organizing and carrying out instruction includes—

* * * * * * *

(2) A program or schedule of instruction.

* * * * * * *

13. Minimum Standards (Superseded)

The following are the minimum standards of candidates for combat vehicle driver training:

a. EDUCATION. Completion of fourth grade.

b. PHYSICAL QUALIFICATIONS. Successfully meet standards set forth in section III (Physical Aptitude Tests), DA AGO PRT 565.

c. CHARACTER AND ATTITUDE. Recommended as dependable and conscientious by officers and noncommissioned officers who have observed the candidate, preferably for a continuous period of at least 6 months.

14. Standards

* * * * * * *

b. FULL TRACK DRIVERS.

(1) No individual is trained as a full-track driver until he has qualified as a wheeled or half-track vehicle driver (see TM 21-300 and DA AGO PRT 561, illustrated in DA AGO PRT 565, for qualification requirements for wheeled vehicles).

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(2) The prospective driver is given a road test in a 2½-ton truck or a half-track, using the check list and procedure listed in **DA AGO PRT 561.** Any prospect who * * * in the training.

20. Army Maintenance System (Superseded)

Since drivers are key men in the Army maintenance system, they should understand what this system is, how it works, and the part they play in it. The instructor should conduct a very basic conference on this subject, using simple charts and words which the driver can understand. Care should be exercised to present the subject from the driver's viewpoint. The conference should include importance of preventive maintenance services; maintenance organization within the battalion; and the three categories of maintenance (organizational, field, and depot), which include the five echelons of maintenance. References: AR 700–105, FM 25–10, TM 37–2810, TM 38–650, and technical manuals for the vehicle.

21. Map Reading, Rules of the Road, and Safety Precautions

* * * * * * *

b. Rules of the Road and Safety Precautions. This subject is covered in the classroom by a conference on traffic rules and regulations, road signs, and safety rules (FM 17–5, FM 25–10, and TM 21–300).

22. Signals

This instruction makes * * * identifying the signals. References: FM 17–5, FM 18–15, FM 22–5, TM 21–300, and **TM 21–306.**

23. Forms and Records (Superseded)

The paragraphs below cover the responsibility for the forms which the driver keeps, fills out, and turns in as prescribed in AR 700–105 and TM 37–2810.

24. Operator's Permit

Give copies of Operator's Permit **(DA AGO Form 9–74)** to student drivers and point out that these fulfill the same purpose for military drivers as the driver's license does for civilian drivers. Emphasize that permits * * * vehicle operator's permits.

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25. Accident Report

Give copies of Standard Form 91 and Identification Card DA AGO Form 614 (AR 700-105), to student drivers and discuss each item on the form. Emphasize the importance * * * of these forms.

26. (Superseded.) Driver's Trip Ticket and Preventive Maintenance Service Record

Give copies of NME Form 110 (see C 1, TM 37-2810) to student drivers, and discuss each item on the form. Make sure that drivers understand the way in which they are to fill out all items especially assigned to them, and point out those items which are not to be filled in by the driver. Emphasize the importance of having the form properly signed. The NME Form 110 is explained in further detail in change 1, TM 37-2810.

27. (Superseded.) Department of the Army Lubrication Orders

Explain Department of the Army lubrication orders (DALO's) and how they are used. Point out that an appropriate DALO of the most recent date is to be carried in each vehicle (par. 37b, AR 700-105). Also point out that it is the driver's responsibility to insure that the DALO in his vehicle has the correct number and date.

36. Maintenance (Superseded)

Maintenance of motor vehicles is conducted under three categories; namely, organizational, field, and depot, depending on whether the repair is made by the using organization on its own equipment, repair for return to user, or repair made for return to stock. Within these categories are included the five echelons of maintenance. Organizational maintenance includes—

a. First Echelon. The maintenance operations performed by the driver, crew, operator, or maintenance team are taught here. This includes the proper care, use, operation, cleaning, preservation, lubrication, and inspection of matériel, and such adjustment, minor repair, and parts replacement as are authorized. Explain in conference, before operation, during operation, at halt, after operation, and weekly maintenance. Divide the students into vehicle crews and have them actually perform all of the first echelon maintenance operations under the supervision of an assistant instructor. (TM 37-2810, TM 38-650, and technical manuals for the vehicle concerned.)

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b. SECOND ECHELON. Those operations performed by specially trained personnel of the using organization. This includes additional preventive maintenance, technical advice, technical supervision, technical assistance, and command inspections. Explain that the driver accompanies the vehicle when it receives second echelon maintenance and may actually perform such work under the supervision of unit maintenance personnel. Show how inefficient drivers can overload the entire maintenance system (AR 700-105).

41. Exercises

Each of the * * * students are proficient.

* * * * * * *

e. EXERCISE No. 5.

(1) *Description.* Shifting into front-wheel drive under ideal conditions.

(2) *Objective.* To teach execution of shifting into front-wheel drive, stressing how and when the shift is made.

* * * * * * *

(4) *Conduct.* The assistant instructor explains the objective and how the exercise is to be conducted. He explains that normally the front-wheel drive is not engaged while driving on level, even terrain with good footing. However, the manipulation and technique are taught while on the driving course so that the student will know how to use it when needed in the cross-country driving phase of the instruction. The instructor demonstrates a shift into front-wheel drive, explains the reasons for not using the front-wheel drive on a hard surface, and demonstrates how to disengage the front-wheel drive. Students drive the course, engaging the front-wheel drive until proficiency is acquired. Vehicle speed is kept very slow during this exercise.

(5) *Instructor's check list.* The instructor checks to see that the student—

(*a*) Uses proper care in engaging front-wheel drive.

* * * * * * *

(*c*) Appreciates the reasons for normally not using front-wheel drive on hard surface road.

(*d*) Disengages front-wheel drive properly.

* * * * * * *

f. EXERCISE No. 6.

* * * * * * *

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(4) *Conduct.* The assistant instructor * * * into low range. The students then drive around the course engaging the front-wheel drive and shifting into and out of low range and disengaging the front-wheel drive until all students are proficient.

(5) *Instructor's check list.* The instructor checks to see that the student—

(*a*) Engages and disengages the front-wheel drive properly.

* * * * * * *

46. Examinations (Superseded)

a. GENERAL. After the student has completed the vehicle operator's course, he not only should be able to handle a vehicle skillfully but also should know the relevant Army Regulations and practices and be able to perform authorized preventive maintenance services. Examinations set forth in DA AGO PRT 565 (*Manual—Examinations for Motor Vehicle Operators*) are provided to determine whether the student meets noncombat military vehicle driver standards. All drivers, both combat and noncombat, must pass the examinations set forth in DA AGO PRT 565. Three additional examinations—an information test, an inspection test, and a road test—are provided in this manual to determine whether the student meets combat military vehicle driver standards. All students who will be expected to drive half-track vehicles under field conditions must pass these examinations. All examinations are conducted by qualified commissioned officers. Individuals who pass these examinations are given authorization to drive vehicles by the signature and rank of the qualifying officer in the authentication column after the appropriate vehicle designation, on the student's *Motor Vehicle Operator's Permit* (DA AGO Form 9–74). All scores and ratings will be entered on DA AGO PRT 559 (*Driver Qualification Record*) except that scores and ratings on existing forms will not be transcribed. DA AGO PRT 559 will become a part of the individual's personnel record.

b. INFORMATION TEST. This test is to determine whether the driver has acquired enough knowledge to be qualified as a combat driver of half-track vehicles. The correct answers are listed on the page following the test. The recommended minimum standard is 38 questions answered correctly.

DRIVER INFORMATION TEST

* * * * * * *

——— 30. Loose track tension may cause early bearing failure.

* * * * * * *

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——— 51. (Added.) The half-track should not be turned short when backing up.

(A) true. (B) false.

——— 52. (Added.) Half-track bogie wheel bearings should be lubricated at least once each week with CG–O or CG–1.

(A) true. (B) false.

——— 53. (Added.) Never force grease past the bogie roller bearing seals.

(A) true. (B) false.

——— 54. (Added.) The slides and linkage of the half-track bogie require periodic lubrication.

(A) true. (B) false.

Test Answers

* * * * * * *

B 29.
A 30.
B 31.

* * * * * * *

A 51. (Added.)
A 52. (Added.)
B 53. (Added.)
B 54. (Added.)

47. Vehicle Inspection Test

One or more * * * 200-mile trip. Perform the Before-Operation Service (NME Form 110) from memory and report to me." Ask the driver * * * on the test.

48. Road Test

* * * * * * *

b. Check List. (1) Following is a suggested "road test check list."

* * * * * * *

10 _____ 43. Near accident.
Years of driving experience _____ Miles last year _____
Hours of driving type of half-track used for test _____

* * * * * * *

c. Suggested Procedures for Road Test

* * * * * * *

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(11) *Miscellaneous.* Check the appropriate item each time excessive speed is used or an accident or near accident occurs.

d. Scoring Road Test. (Superseded.) The "point score" is the sum of the check marks multiplied by their weightings. For example, item 9 checked twice would count 6 points. The addition of all points from items 1 to 43 will give the point score. After a number of drivers have been tested a scale should be worked out so that a "final rating" can be given on the basis of the point score. A rating of 1 includes the best drivers—those with the lowest point scores. Any driving faults not included in the check list should be listed under "Comments." As an educational measure, the various driving faults are explained to the driver at the conclusion of the test.

56. Maintenance (Superseded)

Maintenance of motor vehicles is conducted under three categories, namely, organizational, field, and depot, depending on whether the repair is made by the using organization on its own equipment, repair for return to user, or repair made for return to stock. Within these categories are included the five echelons of maintenance. Organizational maintenance includes—

a. First Echelon. The maintenance operations performed by the driver, crew, operator, or maintenance team are taught here. This includes the proper care, use, operation, cleaning, preservation, lubrication, and inspection of matériel, and such adjustment, minor repair, and parts replacement as are authorized. Explain in conference—before operation, during operation, at halt, after operation, and weekly maintenance. Divide the students into vehicle crews and have them actually perform all of the first echelon maintenance operations under the supervision of an assistant instructor.

b. Second Echelon. Those operations performed by specially trained personnel of the using organization. This includes additional preventive maintenance, technical advice, technical supervision, technical assistance, and command inspections. Explain that the driver accompanies the vehicle when it receives second echelon maintenance and actually may perform such work under the supervision of unit maintenance personnel. Show how inefficient drivers can overload the entire maintenance system (AR 700-105).

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67. Objective

* * * * * * *

c. Exercise No. 19.

(1) *Description.* Formation driving, to include column, wedge, line, and echelon.

* * * * * * *

Section VI. (Superseded.) TRAINING DRIVERS FOR VEHICLES EQUIPPED WITH HYDRAMATIC OR TORQMATIC TRANSMISSIONS

68. General

In training drivers to operate vehicles equipped with hydramatic or torqmatic transmissions require them to drive all exercises from both the left and the right side of the compartment. Follow the phases, courses, and exercises prescribed for training drivers to operate vehicles equipped with the conventional transmission, with the following exceptions:

a. Flat Terrain Driving.

(1) *Hydramatic transmission.*

(*a*) Teach smooth starting and stopping with the transfer unit selector lever and transmission selector lever in "LO" position.

(*b*) Teach easy right and left turns with both selector levers in "LO" position.

(*c*) Teach the correct speeds at which the selector levers may be shifted.

(2) *Torqmatic transmission.*

(*a*) Teach smooth starting and stopping with the transmission in first speed range.

(*b*) Teach easy left and right turns with the transmission selector lever in first speed.

(*c*) Teach up-shifting without letting up on the throttle.

(*d*) Teach the correct shift speeds both up and down (TM 9-735).

b. Intermediate Phase Driving.

(1) Use the same obstacles and stations for precision driving as shown in figures 3 to 5.

(2) Teach the correct position of the selector levers for taking obstacles.

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(3) Teach precautions to be observed in backing up.

c. Cross-Country and Combat Driving.

(1) Use the same exercises prescribed for the vehicle equipped with the conventional transmission.

(2) Check for correct use of selector levers, accelerator, and steering brakes.

d. Time. Normally, it is not necessary to spend as much time on the flat terrain phase of driving with vehicles equipped with the hydramatic and torqmatic transmissions. However, the driver is reminded continually that by manipulating the accelerator and selector levers he can cause the transmission to shift so as to give maximum performance. Stress the precautions and operating procedure listed in technical manuals for vehicles of this type.

70. Required Tests

AR 700–105 directs that vehicle operators' permits be issued only to individuals who have satisfactorily passed an examination conducted by a qualified commissioned officer covering the following subjects:

* * * * * * *

78. Driver's Qualification Badges (Superseded)

The award of a qualification badge is authorized by AR 600–70, as changed, for drivers. A driver, to be eligible to receive the award, must pass aptitude tests, practical and written driver's qualification tests, and must have performed the duties of driver of an Army vehicle for 1 year without traffic violations, without being wholly or partially responsible for any accident, and with a rating of excellent. The award of a qualification badge may be made by commanding officers of regiments, groups, and separate battalions, and any commanding officer of the rank of lieutenant colonel or higher. The officer should award the qualification badge with an appropriate ceremony.

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BY ORDER OF THE SECRETARY OF THE ARMY:

OFFICIAL:
EDWARD F. WITSELL
Major General
The Adjutant General

J. LAWTON COLLINS
Chief of Staff, United States Army

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CHAPTER 1

GENERAL

1. Purpose

The purpose of this manual is to furnish a guide and aid to unit commanders and instructors in achieving and maintaining high standards in tank and half-track driving.

2. Scope

a. This manual contains an outline of the steps necessary in selecting and training driver instructors and examiners, and in driver selection, training, and supervision. It also includes a list of references and a résumé of subject matter not found in readily available references.

b. Instruction for half-track drivers is treated first in this manual because established competence as a wheeled or half-track vehicle driver is a prerequisite to tank driver training. Chapters 1 to 4 inclusive, deal with the selection and training of instructors, the selection of driver candidates and their nonmechanical preliminary training. Chapters 5 and 6 cover the specialized training, examination, and supervision of half-track and full-track drivers respectively.

c. This manual is a sequel to TM 21–300 and instructors must frequently consult that publication. All procedures are carried on in conformity with the principles laid down in TM 21–250.

3. Effect of Driving on Combat Efficiency

a. Armored units are as dependent on their combat vehicles in battle as the infantry soldier is on his rifle. The half-track is the means by which weapons and men move into battle. The tank is a weapon.

b. The driver is the critical factor in maintaining the vehicle in fighting condition. The best designed and constructed vehicles plus the best mechanics in the army cannot compensate for bad driving. Any unit in which driving is below satisfactory standards eventually fails in its mission because of lack of mobility, despite other measures taken to prevent it. This importance of the driver to combat efficiency

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is not always appreciated. Inadequate mobility is often assumed to result from faulty vehicles, unskilled mechanics, difficult terrain, and excessive operational demands when usually it is due to improper driving and lack of or improper first echelon maintenance. Bad driving is not recognized as the source of trouble because its effects (save for accidents) are cumulative rather than immediate, and because officers and noncommissioned officers fail to detect bad driving practices. In spite of these bad practices, the excellence of the vehicle and the work of the mechanics keep the vehicle running for a time. But bad driving practices can and do reduce the normal life expectancy of a vehicle considerably, and increases the maintenance requirements.

4. General Nature of Problem of Selection, Training, and Supervision of Drivers

a. Selecting, training, examining and supervising drivers are the responsibility of commanders of all units equipped with motor transportation. In order to establish and maintain driver efficiency certain definite and progressive steps are followed. AR 850–15 states that before a driver is issued an operator's permit, he must satisfactorily pass an examination on driver's aptitude, mechanical knowledge, operation (under the usual conditions of terrain and traffic), traffic regulations, road procedure, safety precautions, speed limits, vehicle abuse, and maintenance. This manual covers the steps necessary in the driver training and supervision program. To be effective, this training must have the close cooperation and supervision of all commanders as well as the instructors. Higher commanders select competent officer and enlisted instructor personnel and allow time for their training. They see that suitable men are selected for training as drivers. AR 850–15 directs that prevention of vehicle abuse is the commanding officer's responsibility. The only way to prevent vehicle abuse is through proper selection, training, examination, and supervision of the drivers.

b. As a rule, driver training and examination should not be decentralized below battalion level. By centralizing this training in battalions, the fullest use can be made of the best instructors and assistant instructors in the battalion. The work can be better controlled and supervised and the most efficient and economical use can be made of special equipment needed. This centralization does not constitute an encroachment on the prerogatives and responsibilities of company commanders. The company commander selects the men to be trained as drivers and after training requires all drivers to meet specified minimum qualifications. He exercises close supervision of drivers personally and through his platoon and section leaders and crew chiefs.

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CHAPTER 2

PREPARATION FOR CONDUCT OF DRIVER TRAINING

5. Importance

Good driver training results from careful planning and thorough instruction. Well before the time for starting instruction a careful and thorough estimate of the driver training situation must be made. Based upon this estimate, plans and schedules are made. Instructors and assistant instructors are selected, detailed, and trained. Equipment and facilities are obtained and placed in readiness.

6. Estimate of Driver Training Situation

a. When an officer is detailed to conduct a driver training program, he immediately makes an estimate of the driver training situation. He determines such matters as:

(1) How many new drivers are to be qualified.

(2) How many old drivers are to be checked and retrained.

(3) What is the caliber and general experience of new drivers to be qualified.

(4) How much time is available.

(5) How many assistants are available.

(6) What special training do the assistants require.

(7) What facilities are available, including classrooms, visual aids, shops, vehicles, driving ranges, and varied terrain.

(8) What additional facilities are needed and how can these be obtained.

(9) What work must be done to place all equipment and facilities in readiness.

b. The officer charged with the conduct of the course analyzes the information obtained in answer to the above questions and develops a plan for organizing and carrying out preparations and actual conduct of the course.

7. Planning and Organizing the Course

a. The plan for organizing and carrying out instruction includes—

(1) Number of drivers to be trained or retrained.

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(2) A program on schedule of instruction.

(3) How students are to be grouped and how groups will be rotated.

(4) Number of instructors and assistant instructors to be selected and trained and a schedule covering their instruction.

(5) Assignment of duties and responsibilities to instructors and assistant instructors.

(6) A list of equipment and facilities to be obtained and the method to be used to place it in readiness.

b. The plan must be adapted to local requirements and conditions. An example of such a plan is given in appendix I. This example is to be used as a guide in determining the number of hours to be devoted to each phase of driver training, the number of instructors and assistant instructors required, and similar problems.

8. Selecting and Training Instructors

The success of the course depends in a large measure upon the proper selection and training of instructors and assistant instructors. A good noncommissioned officer or a good tank driver is not necessarily a good driving instructor. Neither should it be assumed that an otherwise well-qualified motor and maintenance officer makes a good driving instructor without some special training. In selecting instructors and assistant instructors, prospective instructors who cannot be given a general rating of at least "good" on the qualifications listed on the rating form for evaluating instructors given in TM 21–250 are rejected. In using this form, special attention is given to determining the entry under "Mastery of subject matter." It is to be expected that even those accepted as instructors or assistant instructors need refresher training, but to be accepted, a prospect should at least be a qualified driver with 6 months of actual experience.

9. Training Instructors and Assistant Instructors

After instructors and assistant instructors have been selected, regardless of their apparent qualifications, they are given a preliminary course of instruction before they are permitted to teach. Even though it may be necessary to delay the time when instruction for student drivers may begin, time must be made available for this preliminary course for instructors and assistant instructors. This procedure pays dividends in the long run. The preliminary course for instructors and assistant instructors covers the following:

a. The entire course to be given to student drivers. It probably will not be necessary to spend as much time on this for instructors and assistant instructors as will be scheduled for students. However, the entire course should be covered and the most time given to those phases where instructors and assistant instructors prove to be the weakest.

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b. Application of the principles laid down in TM 21–250 to driver training.

c. Special training in "Controlled Observation in Connection with Driver Training."

d. Special training in the conduct of driver aptitude tests, diagnostic checks, and qualification examinations.

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CHAPTER 3

SELECTING AND CLASSIFYING DRIVERS

Section I. SELECTING DRIVERS

10. Purpose

The purpose of a selection program for drivers is to weed out or eliminate the unfit, and to pick the best from the available prospects. All men who meet the Army's physical standards are not necessarily physically, temperamentally, and mentally capable of becoming satisfactory drivers. Unless these men who are definitely not good training risks are eliminated before training starts, they will cause a great loss of time and damage to equipment.

11. Aptitude Test

The chief means available for determining whom to eliminate in the beginning is the Aptitude Test (par. 13). Unless a man can meet the minimum requirements set up in this test, he is definitely not a good training risk. The required tests and qualifications described in paragraph 13 will eliminate those men who definitely do not possess sufficient aptitude to warrant training. In others, lack of aptitude will show at an early stage of training and they can be eliminated.

12. Number Tested

When the available personnel and training facilities are sufficient, the number of applicants taking the aptitude test should exceed by at least 50 percent the number of qualified drivers required.

13. Minimum Standards

a. GENERAL. The following are the minimum standards of candidates for combat vehicle driver training:

(1) *Education.* Completion of fourth grade.

(2) *Visual acuity.* Not less than 20/20 for each eye.

(3) *Field of vision.* Not less than 75° on each side.

(4) *Night vision.* See *b* below.

b. WHITE CARD TEST. The candidate must be able to recognize the position of a strip of white cardboard 6 x 24 inches against a black

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target at an average distance of not less than 17 yards on a clear moonless night after the eyes have been adapted to the dark for 20 minutes. (See TM 21–300.)

c. COLOR TEST. Various methods may be used to determine whether the candidate lacks color perception. Red and green lights of low intensity viewed in a dark room may be used. The lights should be turned on separately because some color-blind men are able to distinguish these colors when seen together. Another simple method is to have several blocks of the same size and shape colored red and green. The candidate is required to distinguish the red blocks from green. In administering color tests, it must be remembered that a color-blind man is usually aware of his deficiency and may display considerable ingenuity in disguising it.

d. CHARACTER AND ATTITUDE. Recommended as dependable and conscientious by officers and noncommissioned officers who have observed the candidate, preferably for a continuous period of at least six months.

Section II. CLASSIFICATION OF DRIVERS

14. Standards

a. HALF-TRACK DRIVERS. Previous experience as a wheeled vehicle driver is desirable but not essential for a driver candidate. Out of a given number of applicants who meet the standards prescribed in paragraph 13, preference is given to those who have qualified on wheeled vehicles. Regardless of previous experience or the rating the applicant receives on the classification tests, he receives instruction in all phases of instruction. If he learns quickly, he is passed on to the next phase of instruction as soon as possible.

b. FULL-TRACK DRIVERS.

(1) No individual is trained as a full-track driver until he has qualified as a wheeled or half-track vehicle driver (see TM 21–300 and FM 25–10 for qualification requirements for wheeled vehicles).

(2) The prospective driver is given a road test in a 2½-ton truck or a half-track, using the check list and procedure listed in FM 25–10. Any prospect who does not pass the written test and the road test is unqualified for the full-track vehicle drivers' course. After all tests have been completed and the men who have been determined as unfit or unqualified for training have been eliminated, arrange the applicants according to their respective ratings in the group. Pay close attention to the individuals in the lower bracket as they probably will need individual attention and additional instruction. The men in the higher bracket should become proficient in the performance of each of the exercises more quickly and be passed on to the next exercise. Be on the alert for men who show a definite lack of aptitude or indifferent attitude and eliminate them early in the training.

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CHAPTER 4

TRAINING DRIVERS

Section I. INTRODUCTION TO COURSE

15. Principles of Instruction

Driver training, to be effective, must follow the principles of instruction presented in TM 21–250. In all of the steps of driver training the stages of instruction, preparation, presentation, application, examination, discussion and critique are followed. The instructor must be prepared to present his instruction properly. The presentation includes an explanation and, when practicable, a demonstration. After the student has had the subject explained and demonstrated, he is given an opportunity to apply what he has learned. When he has become proficient in the application he is given an examination; after the examination, a critique. *No student is passed to a new phase of training until he has become proficient in the previous phase.*

Section II. PHASES OF INSTRUCTION

16. Phases of Instruction

a. HALF-TRACK DRIVING. This course is divided into six phases:
(1) Nonmechanical preliminary training.
(2) Mechanical preliminary training.
(3) Basic driving.
(4) Driving on open road.
(5) Cross-country driving.
(6) Miscellaneous subjects.

b. FULL-TRACK DRIVING. This course is divided into six phases:
(1) Nonmechanical preliminary training.
(2) Mechanical preliminary training.
(3) Flat terrain driving.
(4) Intermediate driving.
(5) Cross-country driving.
(6) Combat driving.

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Section III. NONMECHANICAL PRELIMINARY TRAINING

17. Objective

a. In addition to being able to handle his vehicle, there are certain things which a driver must know which are not directly related to the mechanics of the vehicle nor the actual handling of the controls. Included are such items as rules of the road, signals, safety precautions, march procedure, road maps and traffic circulation maps.

b. In addition to these subjects there is other nonmechanical training which should be given a driver before he is allowed to practice driving. No man can learn driving without driving. Nonmechanical preliminary training includes fundamentals of driving, how a driver learns, and similar subjects.

18. Fundamentals of Driving

a. Skill in driving can be attained only by practicing correct methods. When the man starts to drive, he finds that judgment, coordination, speed and accuracy are the things that count. The rules of driving can be taught but it is only by closely supervised actual practice that a man becomes a skilled driver.

b. Driving a combat vehicle can be broken down into three steps—seeing, judging, and manipulating.

c. By seeing, is meant seeing the terrain or obstacle with "driver's eye." For example, two drivers look at an obstacle. One sees that it is impassable and selects another route. The other looks but does not see, tries to crash on through, and is stuck. The driver has to see these obstacles that may cause his vehicle to become mired or stuck from quite a distance so that he can avoid them.

d. Judging means deciding what manipulation is called for. As the driver approaches and sees an obstacle, he must decide whether he can cross it or will have to find another route, what gear he will select, at what speed he will approach and cross the obstacle and just how he will manipulate the clutch, accelerator and steering wheel or steering brakes while crossing it.

e. Manipulation means handling the controls. If a man can see and judge correctly but cannot handle the controls so as to make the vehicle do what his judgment calls for, he will not be able to drive. Handling the controls can be broken down into braking and steering and the coordinated manipulation of the clutch, gear shift lever, and accelerator. These simple procedures must be taught so well on flat terrain, where the driver can concentrate on them, that they will become habitual movements.

f. It is the job of the driving instructor to teach the driver these steps of seeing, judging, and manipulating. The only way this can be done is by first telling him how, then demonstrating, and finally super-

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vising him while he practices what he has been shown. The instructor must be alert to catch and correct all errors he makes in seeing, judging, and manipulating. Show him his mistake and have him try again until he performs correctly.

19. How the Driver Learns (Conference—One Hour)

a. If the instructor knows how his student learns he will be better able to teach him and can make sure that he learns correctly. If the driver has some understanding of the processes he must go through to become a skilled driver and the part the instructor plays in helping him, there will be better cooperation between instructor and student.

b. There are several ways to learn. They are by—

(1) Precept—being told by others or by reading books.

(2) Demonstration—followed by imitation.

(3) Trial and error.

(4) Guided practice.

c. You can get valuable information by reading or being told. Much of the hard-earned experience of others is packed into books. But skill cannot be acquired merely by reading or listening. Ideas about driving can be obtained by watching a good driver. That will help but will not make a skillful driver. Skill is acquired by practice.

d. Practice without guidance becomes learning by trial and error. Such practice is a process of trying first one method and then another, until finally, by accident, luck, or common sense, a method that works is found. This is the method that beginners use unless they are closely supervised.

e. The trial and error method—

(1) Wastes time.

(2) Causes undue wear and breakage of equipment.

(3) Induces the student to form bad habits of which he may not be aware and which may persist through his entire driving career.

f. The best way to learn to drive is to practice under expert supervision. This insures correct driving habits, prevents undue wear on the equipment, makes learning much faster and produces a better driver. It is your job as instructor to guide the student's practice and prevent him from forming bad habits.

g. If you had to stop and think out everything you did and every move you made in preparing for a trip, it is unlikely that you would start at all. By habit we do things automatically, without thinking of them at all. This is especially true of movements which we make in carrying out the business of everyday living, or of movements we make in skills we have acquired.

h. Whenever we learn to do something new, new habits are acquired. If we analyze the new skill and find out just what new habits are neces-

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sary, we are able to shorten the time it will take to acquire that skill and also to improve its quality.

i. In order to teach combat vehicle driving it is worth while to analyze the operation to discover what habits are necessary and most helpful in making reliable and efficient drivers.

j. Habits most necessary for good driving fall in three groups:

(1) Habits relating to simple mechanical operations.

(2) Habits related to more involved and thoughtful practices of driving.

(3) Emergency habits.

k. The following are habits relating to simple mechanical procedures:

(1) Starting the engine.

(2) Shifting gears.

(3) Using the accelerator.

(4) Using the clutch.

(5) Steering and braking.

(6) The foregoing habits involve muscular adjustments. Through repeated practice, the skillful driver makes the movements necessary to accomplish these things automatically or without thought.

l. Habits relating to the more involved and thoughtful practices of driving are:

(1) Watching the instrument panel and being alert for any instrument reading that is unusual.

(2) Being alert for unusual noises and odors.

(3) Operating in the correct gear and at the proper engine speed.

(4) Selecting the route which will cause the least wear and tear on the vehicle whenever possible.

(5) Observing all safety rules.

(6) Being alert to all signals and obeying them promptly.

(7) Performing a thorough inspection of the vehicle as prescribed in technical and field manuals.

(8) These might be called more mental than physical habits and for this reason they are more easily overlooked by the instructor and the student than are the habits relating to simple mechanical operations. For example, unless the instructor is watching the student closely at the beginning of his driving, the student will not form the habit of glancing frequently at his instrument panel. Neglect in forming these habits correctly at the very beginning of instruction will cause just as much harm as neglect in any phase of instruction. The instructor is particularly alert to determine by observation and questioning the student that these habits are being formed correctly from the start.

m. Emergency Habits. (1) "Emergency habits" should enable the driver to do the right thing in an emergency without having to think

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about it. But an emergency presents an unforseen combination of conditions and events and generally the situation requires very rapid reaction. At such times a background of sound driving habits comes to the rescue. Much that should be done is done automatically. Consequently, the driver's attention is freed to attend to whatever features of the emergency require immediate attention, judgment and quick decision. All habits named as relating to the "simple mechanical operations" or the "more involved and thoughtful practices of driving" are serviceable in an emergency. One habit that is a definite "emergency habit," is *the habit of attention:*

(*a*) To the vehicle.

(*b*) To the road or terrain.

(*c*) To other vehicles or troops in the vicinity.

(*d*) To probable sources of enemy action.

(2) Driving cannot be done with inattention and nonchalance.

n. Summarizing briefly—

(1) The best method of learning to drive is by closely supervised practice.

(2) A large part of driving becomes habit.

(3) It is impossible to turn out good drivers unless the practice is supervised so closely that only good driving habits are formed.

20. Army Maintenance System

Since drivers are key men in the Army maintenance system, they should understand what this system is, how it works, and the part they play in it. The instructor should give a very basic conference on this subject, using simple charts and words which the driver can understand. Care should be exercised to present the subject from the driver's viewpoint. The conference should include importance of preventive maintenance services, echelons of maintenance, and maintenance organization within the battalion. References: AR 850–15, FM 25–10, TM 9–2810 and 38–250, and Technical Manuals for the vehicle.

21. Map Reading, Rules of the Road, and Safety Precautions

a. Map Reading. This instruction covers reading of military road maps and traffic maps (FM 21–25 and FM 101–15).

b. Rules of the Road and Safety Precautions. This subject is covered in the classroom by a conference on traffic rules and regulations, road signs, and safety rules (TM 10–460, 21–300, FM 25–10 and FM 17–5).

22. Signals.

This instruction makes the driver thoroughly familiar with hand, flag and light signals. Explain the signals by conference and demon-

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stration. Divide the students into groups of two and have them alternate in giving and identifying the signals. References FM 17–5, 18–15, 22–5, TM 10–460 and 21–300.

23. Forms and Records

The paragraphs below cover the responsibility for the forms which the driver keeps, fills out, and turns in as prescribed in AR 850–15 and TM 9–2810.

24. Operator's Permit

Give copies of Operator's Permit (WD, O. O. Form No. 7360) to student drivers and point out that these fulfill the same purpose for military drivers as the driver's license does for civilian drivers. Emphasize that permits are evidence that the driver has demonstrated that he is competent to handle various types of army vehicles, and that all drivers endeavor to justify the confidence the Army has placed in them. Point out that the driver may operate only the types of vehicles specified on the motor vehicle operator's permit on which qualified. Call attention to the provisions made on these permits for recording accidents and stress that the permit will be revoked when accidents or other causes warrant. After answering all questions concerning these forms, state that when the students complete the course and pass their examination, they will receive motor vehicle operator's permits.

25. Accident Report

Give copies of Standard Form No. 26 and identification card (AR 850–15) to student drivers, and discuss each item on the form. Emphasize the importance of filling out this form in its entirety at the scene of the accident and delivering it as soon as possible after the accident to the immediate superior officer. Stress the importance of getting the names of witnesses and giving full and correct details concerning the accident. The driver's accident report form must be kept in the vehicle at all times, and a driver, before starting on any trip, makes sure that he has one of these forms.

26. Driver's Trip Ticket and Preventive Service Record

Give copies of WD Form No. 48 to student drivers, and discuss each item on the form. Make sure that drivers understand the way in which they are to fill out all items especially assigned to them, and point out those items which are not to be filled in by the driver. Emphasize the importance of having the form properly signed. Form No. 48 is explained in further detail in TM 9–2810.

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27. Modification Work Order and Major Unit Assembly Replacement Record

Explain WD, AGO Form No. 478 and point out that it is a form to be placed in the vehicle and to be retained there until the vehicle is removed from service. It is a mechanical record. Personnel completing modification or major unit assembly replacement will record a clear description of the work completed, and initials, hours, mileage, and MWO number. When major unit assemblies (engine, transmissions, transfer case, and tracks) are replaced, record date, hours, mileage, and nomenclature of unit assembly. Minor repairs, parts, and accessories replacement are not recorded. While it is a mechanical record, it is the driver's responsibility to see that it is in the vehicle.

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CHAPTER 5

HALF-TRACK VEHICLES

Section I. MECHANICAL PRELIMINARY TRAINING

28. Objective

a. The objective of this phase of training is to give the driver sufficient knowledge of the nomenclature and functioning of the vehicle installations and major units and the characteristics of the vehicle so that he will be able to operate and maintain it intelligently. It is impossible to develop and maintain efficient drivers unless they are thoroughly grounded in these basic subjects. It is just as important for a driver to know the nomenclature and functioning of his vehicle and its characteristics before he starts actually driving as it is for a machine gunner to know the nomenclature and functioning of his weapon before going on the range to fire. Thorough ground work in these subjects will save much time and wear on equipment when the driver starts actually operating a vehicle. *He must know enough of the functioning of the major units to be able to recognize and prevent vehicle abuse, and to know why, when and how to perform first echelon maintenance.*

b. Because of the variety of standard half-track vehicles in use, this manual gives no specific instruction on any one of them. Instructors use the Technical Manual and Field Manual for the vehicle concerned.

29. Half-Track Characteristics and Assemblies

The objective of this instruction is to teach the capabilities and limitations of the vehicle which concern the driver and to teach him the nomenclature, functioning, and *first echelon maintenance of the vehicle.* Give a short conference on the vehicle characteristics, and location and maintenance of assemblies, then give each student a sheet on which the assemblies are listed. Divide the students into groups of four with an assistant instructor and one vehicle for each group. Have the assistant instructor point out the assembly on the vehicle, explain its functioning, and the first echelon maintenance required to each of his students.

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30. Brakes, Tracks, and Suspension

Teach the nomenclature, function, and first echelon maintenance of the brakes, tracks, and suspension in a conference, using a half-track or a chart to point out the various units, their construction, maintenance, and adjustments required. Then divide the students into groups of four with an assistant instructor and one vehicle for each group. Have the students make the inspections of the track and suspension, remove the track, replace the track, and make a track adjustment.

31. Power Train

The students are taught the location, functioning, and first echelon maintenance of the power train units. Enough of the functioning of units must be taught so that the students will be able to operate and maintain them properly. Construct simple charts to be used in explaining the functioning of the clutch, transmission, transfer case, and differential. In explaining the clutch and clutch linkage take the students to the shop and show them a clutch, transmission, and differential which have been disassembled. Explain and demonstrate first echelon maintenance required.

32. Engine

Teach enough of the functioning of the engine so that the student will be able to recognize and prevent vehicle abuse. By the use of simple charts or drawings, explain the principle of operation of an internal combustion engine. Then by the use of charts, drawings, and the engine itself, apply this principle to the actual operation or functioning of this engine. During the instruction stress the effects on the engine of improper operation, such as lugging, operating at too high rpm, too high temperature, low oil pressure, and failure to warm the engine up. Explain and demonstrate the first echelon maintenance of the engine and engine accessories.

33. Electrical System

The student learns the locations and functions of the electrical units, first echelon maintenance required, and the trouble shooting and repair a driver is required to make. Divide the students into groups of four with one assistant instructor and one vehicle for each group. Have the assistant instructor point out the location and explain and demonstrate the operation and maintenance on units such as battery, generator, switches, fuse box, wiring conduits, and lighting systems.

34. Instruments and Controls

This instruction covers the locations, proper readings, and meaning of the readings of each of the instruments, the importance of con-

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stantly observing the instruments, and actions to be taken in case of abnormal readings. The location and operation of the controls are shown. Explain these in a conference and then divide the students into groups of four with one assistant instructor and one vehicle for each group. Have the assistant instructor point out each of the instruments and its correct readings and what would be considered an abnormal reading. Also point out each of the controls and explain how to operate them.

35. Starting, Warm Up, Cooling Off, and Stopping the Engine

Teach the correct procedure in starting, warming up, cooling off, and stopping the engine. Explain the importance of following the correct procedure. Cover this subject in a conference, then divide the students into groups of four with one assistant instructor and one vehicle for each group and have them practice the procedures explained in the conference.

36. Maintenance

a. First Echelon. The maintenance performed by the crew, the frequency with which it is performed and the importance of performing it thoroughly, are taught here. Explain in conference, before operation, during operation, at halt, after operation, and weekly maintenance. Divide the students into vehicle crews and have them actually perform all of the first echelon maintenaance operations under the supervision of an assistant instructor. TM 9–2810, 38–250, and technical manuals for the vehicle concerned.

b. Second Echelon. The objective of this instruction is to familiarize the student with the driver's part in 2nd echelon maintenance of his vehicle. Explain that the driver accompanies the vehicle when it receives 2nd echelon maintenance and may actually perform such work under the supervision of unit maintenance personnel. Show how inefficient drivers can overload the entire maintenance system (AR 850–15).

37. Crew Drill

In this the student learns to perform first echelon maintenance as a part of the vehicle crew in formal parks formations. Make up cards listing the duties of each of the crew members. Give one of these cards to each of the students, and explain each of the duties listed. Then divide the students into crews with one assistant instructor and one vehicle for each crew. Assign each student the duties of one of the members of the crew and have them go through the crew drill. After they have gone through the crew drill have the members of the crew rotate until each has performed the duties of

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all members of the crew. Repeat this until they are proficient (FM 17–71).

38. Stowage

a. Explain the principles of vehicle stowage, that the stowage of half-tracks is as prescribed by the technical manual for the vehicle or by the organization commander. Since crews may be expected to fight from the vehicle, stowage always is arranged so as not to interfere with crew members in combat. The stowage of the vehicle with its normal crew is the responsibility of the car commander. However, there are many occasions when half-tracks may be expected to carry special loads of personnel and supplies without the supervision of the car commander. Under such circumstances the driver is responsible for proper loading of the vehicle. He must know the principles of loads, loading, and lashings as prescribed in TM 21–300 and the limitations of his vehicle.

b. Demonstrate proper stowage of half-tracks with the normal load for several types. Divide the students into crews and unload and re-stow the vehicles. Then demonstrate the loading of a half-track such as a personnel carrier and as a cargo vehicle. Show the proper method of lashing the load and the places at which lashings are fastened. Emphasize the dangerous practices to be avoided, such as placing heavy material on top of the load, at the rear of the vehicle, or on one side so that the springs will carry unequal weights. Point out that lashings work loose and must be checked at every halt, and tightened if necessary.

Section II. BASIC DRIVING

39. Objective

a. The objective of basic driving is to familiarize drivers with the characteristics of half-track vehicles and teach correct driving habits under relatively easy conditions. Good basic driving form makes more difficult operations easier to learn.

b. In this phase of training, drivers acquire habits to which they cling all through their careers. Therefore, driving instructors and assistants carefully study the objectives described for each exercise, understand them thoroughly, and make them understood to student drivers.

40. Driving Range

A driving range for basic driving instruction should be selected using the best available area. An existing road net in the form of a square approximately 300 feet on a side or a large open area such as a motor park or a field of good solid earth will make a good driving range on which the drivers may be trained in the elementary technique of half-track driving (fig. 1). This type of area provides for continual supervision by the officer in charge of the operation of all the vehicles. This size range will safely accommodate 10 vehicles at a time.

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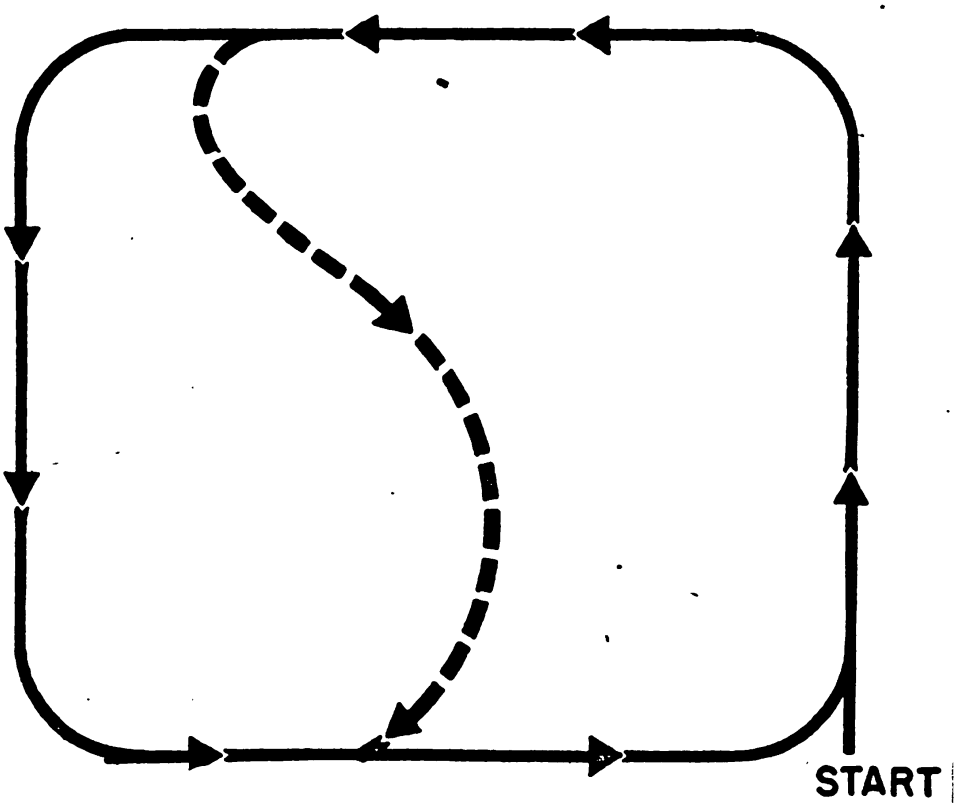


Figure 1. Driving range for half-tracks.

41. Exercises

Each of the following exercises covers one stage in the training of a driver. With each description of an exercise is a statement of the objective of the exercise and a check list for the use of the instructor in conducting the training. These exercises, planned for units of 20 students each, will require ten vehicles and ten assistant instructors. The coach and pupil method is used. While one student is driving, the other uses the instructor's check sheet as a guide in observing for correct procedures. An assistant instructor is with each vehicle to explain and supervise each exercise. He is capable of demonstrating each exercise and critiquing the student during the entire training program. Each exercise is repeated until both students are proficient.

a. Exercise No. 1. (1) *Description.* Manipulation of controls; moving in first and reverse gears and stopping.

(2) *Objective.* To teach the correct coordination of clutch and accelerator movements, putting vehicle into motion smoothly and confidently, putting vehicle in motion without lugging or racing the engine and slipping the clutch, and application of brakes and disengagement of the clutch at the right instant to achieve a smooth stop.

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(3) *Set-up.* Driving range (figure 1), vehicles are moved back and forth along the sides of the course.

(4) *Conduct.* Two students and the assistant instructor are mounted in the half-track. The student who is acting as coach sits in the car commander's seat; the assistant instructor sits in the center seat between the driver and the coach. The instructor explains objective and execution of the exercise and demonstrates. The half-tracks move back and forth until all drivers are proficient.

(5) *Instructor's check list.* The instructor checks to see that the student—

(*a*) Maintains correct engine speed when starting to move forward.

(*b*) Engages clutch smoothly and without jerking.

(*c*) Fully releases clutch after vehicle starts to move.

(*d*) Stops smoothly.

(*e*) Disengages clutch smoothly when stopping.

(*f*) Drives carefully and slowly in reverse to avoid throwing the track.

(*g*) Shows confidence and obtains smoothness of operation.

(*h*) Observes instruments.

b. Exercise No. 2. (1) *Description.* Shifting up in the forward gears. Move vehicles around the course using 1st, 2nd, and 3rd gear ratios, then stop.

(2) *Objective.* To teach the correct coordination of clutch, accelerator, and gear shift lever in executing smooth up-shift; steering vehicle around curves in course is included.

(3) *Set-up.* Driving range (figure 1), vehicles move in column at maximum practicable interval.

(4) *Conduct.* Seating arrangement is as in Exercise No. 1. The assistant instructor explains the objective of the exercise, how it is executed, and then demonstrates a smooth up-shift, calling to the students' attention all pertinent details such as the engine RPM at which the shift is made, when the clutch is depressed, how the accelerator is coordinated and how the shifting lever is moved, and the proper position of the driver in the vehicle. Each student executes the exercise until proficient.

(5) *Instructor's check list.* The instructor checks to see that the student—

(*a*) Starts the shift at the correct engine RPM.

(*b*) Finishes shift without undue delay.

(*c*) Does not lug or race engine.

(*d*) Does not slip clutch after shifting while gaining speed.

(*e*) By proper coordination of clutch and accelerator accomplishes smooth shift.

(*f*) Does not clash gears.

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(*g*) Steers smoothly and stays on course.
(*h*) Maintains proper speed on turns.
(*i*) Observes instruments.
(*j*) Shows confidence and smoothness.

c. EXERCISE No. 3. (1) *Description.* Shifting down from third to second and second to first on level course.

(2) *Objective.* To teach the execution of a smooth down-shift, stressing coordination or clutch and accelerator, double clutching, and the relative engine and vehicle speeds in shifting.

(3) *Set-up.* The same as Exercise No. 2.

(4) *Conduct.* The assistant instructor explains the objectives and how the exercise is executed. He then demonstrates a smooth shift from third down to second and from second to first. The student then drives the half-track paying close attention to the speeds at which he shifts into the lower gear. The use of double-clutching and how it is accomplished smoothly is stressed. It is emphasized at this time that shifting to lower gears is *not* used to slow the vehicle down when coming to a normal stop on level terrain.

(5) *Instructor's check list.* The instructor checks to see that the student—

(*a*) Starts shift at proper speed.
(*b*) Uses proper clutch-accelerator coordination.
(*c*) Completes shift in reasonable time.
(*d*) Does not clash gears.
(*e*) Double clutches properly.
(*f*) Does not make the vehicle jerk or buck when releasing clutch.
(*g*) Observes instruments.
(*h*) Shows confidence and smoothness.

d. EXERCISE No. 4. (1) *Description.* Starting, shifting, and driving on level course.

(2) *Objective.* To teach the proper coordination in the driving of a half-track on level road under ideal conditions. Includes shifting gears up and down through all forward speeds as the driving situation requires.

(3) *Set-up.* Same as Exercise No. 2.

(4) *Conduct.* The assistant instructor explains the objective of the exercise and how it is to be executed. Each student in turn then drives around the course until he has acquired the ability to handle the half-track smoothly under these fairly ideal driving conditions. When half way through the exercise, at a signal from the group instructor, the vehicles are driven diagonally across the course, as indicated by the dotted line in figure 1, so that the course will be reversed and right turns instead of left will be made.

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(5) *Instructor's check list.* The instructor checks to see that the student—

(*a*) Maintains correct engine speed when starting to move the vehicle.

(*b*) Uses proper clutch accelerator coordination.

(*c*) Does not clash gears.

(*d*) Engages clutch smoothly and without jerking.

(*e*) Fully releases clutch after shift is completed.

(*f*) Stops smoothly.

(*g*) Disengages clutch at proper instant when stopping.

(*h*) Shifts down smoothly and at proper time.

(*i*) Shows confidence and obtains smoothness of operation.

e. Exercise No. 5. (1) *Description.* Shifting into front axle drive under ideal conditions.

(2) *Objective.* To teach execution of shifting into front axle drive, stressing how and when the shift is to be made.

(3) *Set-up.* Same as for Exercise No. 2.

(4) *Conduct.* The assistant instructor explains the objective and how the exercise is to be conducted. He explains that normally the front axle drive is not engaged while driving on level, even terrain with good footing. However, the manipulation and technique is taught while on the driving course so that the student will know how to use it when needed in the cross-country driving phase of the instruction. The instructor demonstrates a shift into front axle drive, explains the reasons for not using the front axle on a hard surface, and demonstrates how to disengage the front axle drive. Students drive the course, engaging the front axle until proficiency is acquired. Vehicle speed is kept very slow during this exercise.

(5) *Instructor's check list.* The instructor checks to see that the student—

(*a*) Uses proper care in engaging front axle drive.

(*b*) Does not clash gears.

(*c*) Appreciates the reasons for normally not using front axle drive on hard surface road.

(*d*) Disengages front axle drive properly.

(*e*) Observes instruments.

(*f*) Shows confidence and smoothness.

f. Exercise No. 6. (1) *Description.* Shifting the transfer case into low range.

(2) *Objective.* To teach shifting the transfer case into low range, stressing the technique of shifting, and the circumstances under which low range is to be used.

(3) *Set-up.* Same as for Exercise No. 2.

(4) *Conduct.* The assistant instructor explains the objective and how the exercise is executed. He explains that low range is not nor-

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mally used for driving on a level, hard surface road, but that the exercise is being performed as preparation for the later cross-country driving phase of the instruction. He demonstrates how to shift into low range. The students then drive around the course engaging the front axle and shifting into and out of low range and the disengaging front axle drive until all students have become proficient.

(5) *Instructor's check list.* The instructor checks to see that the student—

(*a*) Engages and disengages the front axle drive properly.

(*b*) Uses the clutch properly in shifting into low range.

(*c*) Uses proper clutch-accelerator coordination in shifting from high range into low range.

(*d*) Does not clash gears.

(*e*) Maintains control of his vehicle while manipulating the controls.

(*f*) Observes instruments.

(*g*) Shows confidence and smoothness.

g. EXERCISE No. 7. (1) *Description.* Precision driving.

(2) *Objective.* To teach the technique of handling the half-track in precision movements, stressing the limited turning radius of the vehicle, the danger of throwing the track when driving in reverse, the limitations on visibility from the driver's seat, the technique of giving and following guiding signals, and the importance of judging distances accurately.

(3) *Set-up.* The exercise is conducted on the course shown in figures 3 and 5. The backing stall in figure 3 should have the same dimensions as for a light tank.

(4) *Conduct.* The assistant instructor explains the objective and how the exercise is executed. The half-tracks are distributed among the various stations and drivers are sent to other stations when they have become proficient at one station. Continue until each student is proficient at each station.

(5) *Instructor's check list.* The instructor checks to see that the student—

(*a*) Obeys signals promptly.

(*b*) Stays between guide posts when moving into the stall.

(*c*) Stays on treads of simulated treadway bridge.

(*d*) Does not run off the loading ramp.

(*e*) Makes proper use of power in climbing ramp. Does not stall or lug the engine.

(*f*) Does not ride or slip the clutch.

(*g*) Obeys safety rules in following a dismounted guide.

(*h*) Shows confidence and smoothness.

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Section III. ROAD DRIVING

42. Objective

The objective of the road driving phase of half-track driver instruction is to develop in the student a smooth, coordinated driving skill. By gaining considerable road driving experience under the close supervision of a competent instructor, the student will develop good driving habits from the principles that were taught him in the basic driving exercises. In this driving practice he will get the "feel" of his vehicle so that in the later stage of cross-country driving he will be able to judge the performance of his vehicle and know its capabilities.

43. Exercise No. 8

The same general principles govern the conduct of this exercise as for the basic driving exercises.

a. DESCRIPTION. Driving on the open road, including good and bad road surfaces, hills, and level stretches.

b. OBJECTIVE. To teach and develop smooth coordination in driving and develop sound driving judgment.

c. SET-UP. A previously reconnoitered road route marked with standard guide symbols so that vehicles can proceed individually along the route. It includes as great a variety of road conditions as possible such as hills, various road surfaces, winding and straight stretches and, in the latter part, some congested areas.

d. CONDUCT. The assistant instructor explains the objective and how the exercise is to be conducted. The vehicles then proceed independently over the prescribed course with each student driving the entire course and then the other student driving the course until each student shows the necessary degree of proficiency. The instructor is continually alert for proper driving technique and for safety precautions.

e. INSTRUCTOR'S CHECK LIST. The instructor checks to see that the student—

(1) Starts the vehicle smoothly.
(2) Shifts easily and with good clutch-accelerator coordination.
(3) Controls the vehicle well using good driver-judgment.
(4) Observes the rules of the road and adequate safety precautions.
(5) Exhibits good driver technique in regard to posture, grip on the steering wheel, road signals, and alertness.
(6) Observes instruments.
(7) Shows confidence and smoothness.

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Section IV. CROSS-COUNTRY DRIVING

44. Objective

The objective of the cross-country driving phase is to teach the student to apply the skill, judgment and knowledge he has learned in the preceding training, and to increase his knowledge of the capabilities and limitations of his vehicle. Much of the tactical driving of the half-track is cross-country and it is important to develop his appreciation for the problems he will encounter in these situations.

45. Exercises

The same general principles govern the conduct of these exercises as for the previous driving exercises.

a. Exercise No. 9. (1) *Description.* Learning the vehicle's capabilities and limitations.

(2) *Objective.* To teach the students to recognize terrain and obstacles that their vehicle will or will not traverse.

(3) *Set-up.* Select and mark a course containing various types of terrain and obstacles, such as grades, woods, ditches, mud, sand, stumps or boulders. Some of these the vehicles, driven by the best drivers available, will traverse, and some they will not traverse.

(4) *Conduct.* At the beginning of the course, have the students dismount and walk over the course with the half-tracks following them. As they reach each obstacle have each decide whether the vehicle will negotiate it and the best method of approaching and crossing it. Then have one of the vehicles attempt to take the obstacle. Hold a critique on the method used and on the way the vehicle negotiated or failed to negotiate the obstacle. Repeat this procedure for each obstacle in the course.

b. Exercise No. 10. (1) *Description.* The driver is required to:

(a) Drive over vertical obstacles.

(b) Drive through woods.

(c) Drive through mud and sand.

(d) Ascend and descend steep hills; stop, back up and start while ascending and descending steep hills.

(e) Ford.

(2) *Set-up.* Ten half-tracks with one assistant instructor and two students per half-track. Lay out a course containing each of the types of driving listed in (1) above. The vertical obstacle can be constructed with logs, or a suitable ditch with vertical banks may be used. If a suitable course through woods is not available, a substitute course can be constructed with stakes to represent trees. Select short grades of about 25° slope. To avoid possible drowning out of engines, the depth of the ford should be about one foot less than the maximum

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fording ability of the vehicle. In order to save time in moving from one obstacle to another, have them as close together as practicable.

(3) *Conduct.* At the first obstacle the assistant instructor explains the objective and explains and demonstrates how to negotiate the obstacle. The vehicles are assembled in close column, and the students drive them across the obstacle, forming again in close column after crossing it. The instructor holds a critique on each student, using the instructor's check list as a guide. The students rotate on their vehicle after crossing the obstacle. When all students are proficient on one obstacle, they are moved on to the next and the procedure is repeated.

(4) *Instructor's check list.* The instructor checks to see that the student—

(*a*) Approaches the obstacle at the correct speed.
(*b*) Crosses in the correct gear.
(*c*) Maintains correct engine speed.
(*d*) Uses the clutch, accelerator, and brakes at right time.
(*e*) Negotiates the obstacle smoothly.
(*f*) Shows confidence and smoothness.

c. Exercise No. 11. (1) *Description.* Cross-country driving.

(2) *Objective.* To teach the selection of routes from within the vehicle, and the operation of the vehicle across country over varied terrain.

(3) *Set-up.* Ten half-tracks with one assistant instructor and two students per half-track. Select a training area which contains various types of terrain, and mark a number of starting points and objectives with a distance of 100 yards or more between the starting point and objective.

(4) *Conduct.* At point No. 1 point out objective No. 1. Explain the objective of the exercise. Have each of the students drive over the ground to the objective, selecting what he considers to be the easiest route as he goes. When all of the vehicles have reached objective No. 1, change drivers and repeat the procedure between starting point No. 2 and objective No. 2. Repeat until all students are proficient. Hold a critique when each objective is reached.

(5) *Instructor's check list.* The instructor checks to see that the student—

(*a*) Uses clutch-accelerator properly when starting.
(*b*) Does not slip the clutch.
(*c*) Keeps the engine within correct rpm limits.
(*d*) Does not lug the engine.
(*e*) Does not ride the clutch.
(*f*) Maintains control of the vehicle at all times.
(*g*) Shows good judgment in selection of gears, speeds, and routes.
(*h*) Shifts up and down smoothly and makes proper use of clutch and accelerator.

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(*i*) Maintains proper distance and interval with respect to other vehicles.

(*j*) Observes instruments.

(*k*) Shows confidence and obtains smooth operation.

Section V. EXAMINING DRIVERS

46. Examinations

a. GENERAL. After the student has completed the half-track vehicle operator's course, he should not only be able to handle a half-track vehicle skillfully but he should also know the relevant Army Regulations and practices and be able to perform authorized preventive maintenance services. Three tests are provided to determine whether he meets combat vehicle driver standards. They are an information test, an inspection test, and a road test. Tests are conducted by a qualified commissioned officer. Authorization to drive half-tracks is given individuals who pass this examination by the signature of the examining officer in the "authentication" column after car, half-track, on the student's Army Motor Vehicle Operator's Permit, W. D., O. O. Form No. 7360.

b. DRIVER'S INFORMATION TEST. (1) This test is to determine whether the driver has acquired enough knowledge, after taking the driver's course, to be qualified as a driver of a half-track vehicle.

(2) *Answers.* The correct answers are listed on the page following the test. Scoring of a test paper is facilitated by placing the first column of the answer key beside the student's answers on the first page of the test. The number of correct answers on that page can then be determined immediately. Use the same system for scoring all pages. The recommended minimum standard is 30 questions answered correctly.

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DRIVER INFORMATION TEST

(For final qualification)

Instructions

Read each question carefully. Select the best answer to each question. On the black line to the left of the question number, write the letter preceding what you think is the best answer. Notice how the sample is marked.

SAMPLE QUESTION:

A The right foot is used to step on the brake pedal.

(A) true. (B) false.

The right foot is used to step on the brake pedal, so the statement is true. Therefore, the letter A has been placed on the blank line preceding the question number.

Mark only one answer to each question.

_____ 1. Holding your left foot on the clutch pedal while driving is known as "riding the clutch" and results in (A) excessive clutch wear. (B) the rear wheels turning more slowly. (C) more control over the car. (D) easier gear shifting.

_____ 2. In backing down a hill, the driver should put the vehicle in neutral.

(A) true. (B) false.

_____ 3. When skidding on a slippery road, you should—(A) use the emergency brake. (B) depress the clutch. (C) steer in the direction in which the rear end is moving.

_____ 4. Hitchhikers, if in military uniform, may be given a ride in an Army vehicle.

(A) true. (B) false.

_____ 5. Tire pressure should be checked—

(A) daily. (B) weekly. (C) every other day.

_____ 6. To check for leaks the driver crawls under the vehicle while the engine is running.

(A) true. (B) false.

_____ 7. A cranking motion with the right arm is a signal to—(A) decrease speed. (B) start engine. (C) reverse. (D) mount vehicle.

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_____ 8. Cleaning of an Army motor vehicle is the responsibility of the driver.

(A) true. (B) false.

_____ 9. If the lights change when pedestrians are in the center of the street, the driver should—

(A) wait until the pedestrians are out of the way.
(B) start before the pedestrians get in the way.
(C) sound the horn and proceed.

_____10. Track tension on half-track vehicles becomes greater as more load is added.

(A) true. (B) false.

_____11. In traveling in a convoy, a driver of one of the convoy vehicles may—

(A) pass slower moving vehicles in the convoy.
(B) pass a vehicle that has engine trouble.
(C) exceed the local speed limit.

_____12. When you drive out of a filling station yard, street traffic on your left has the right of way.

(A) true. (B) false.

_____13. Army drivers must obey the same laws as civilian drivers, except on special occasions.

(A) true. (B) false.

_____14. When you are not in convoy, you are allowed to pass a convoy without special authority.

(A) true. (B) false.

_____15. The left arm extended at a 45° angle above the horizontal is a signal for —

(A) a right turn. (B) a left turn. (C) slowing down. (D) stopping.

_____16. If the driver discovers a mechanical condition injurious to further operation of the vehicle while in convoy, he should—

(A) continue at reduced speed. (B) drop to the back of the column. (C) signal the driver behind for assistance. (D) stop and signal for other vehicles to pass.

_____17. When vehicles of a convoy are halted, they should—

(A) pull on to the shoulder. (B) stay in the middle of the road. (C) place the right side in a ditch.

_____18. The distance between vehicles in a convoy should be—

(A) equal to the speedometer reading in yards.
(B) as the column commander directs.
(C) twice the speedometer reading in yards.
(D) 150 feet.

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_____19. At a halt the driver should first—

(A) rest. (B) unload troops. (C) inspect the vehicle. (D) talk with the other drivers to see if they need help.

_____20. You should notice what the instrument panel gauges indicate—

(A) each time you visit the filling station.
(B) frequently in the course of driving.
(C) every 500 miles.
(D) once a week.

_____21. Blackout lights are always used for travel at night.

(A) true. (B) false.

_____22. The front wheel drive should be engaged only after a vehicle becomes stalled.

(A) true. (B) false.

_____23. Fuel shut-off cocks on the half-track fuel tanks should be left in the ON position when parked overnight.

(A) true. (B) false.

_____24. Scales are the only means of determining whether a truck is overloaded.

(A) true. (B) false.

_____25. If the driver ahead of you in a convoy gives the signal to pass, you should pass him.

(A) true. (B) false.

_____26. Convoys are not required to observe speed laws.

(A) true. (B) false.

_____27. To make the track adjustment on a half-track place a straight edge on the track and suspend a 150-lb. weight on the track midway between the track support roller and rear idler and the proper clearance should be ¼ inch.

(A) true. (B) false.

_____28. The front wheel drive should not be used for—

(A) 6 percent grades on hard roads. (B) cross-country driving. (C) slippery roads.

_____29. In small towns it is desirable to park a convoy on a dead-end street.

(A) true. (B) false.

_____30. The maximum load of a truck may be exceeded in an emergency without special authorization.

(A) true. (B) false.

_____31. In crossing ditches, the driver should depend largely on momentum to carry the truck through.

(A) true. (B) false.

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_____32. Blackout lights are used primarily to—

(A) make the vehicle visible to others on the highway. (B) illuminate the road a short distance ahead.

_____33. When approaching an unguarded railroad crossing in an Army vehicle, you should—

(A) slow to 5 mph. (B) slow down so a stop can be made if necessary. (C) come to a stop, if visibility is restricted. (D) stop.

_____34. During freezing weather, vehicles should be parked on brush or weeds in preference to the bare ground.

(A) true. (B) false.

_____35. Brakes should not be applied when the front-wheel drive is engaged.

(A) true. (B) false.

_____36. Standard form No. 26 is—

(A) trip ticket. (B) an Army license. (C) an accident report form. (D) a gasoline ticket.

_____37. In driving in a convoy at night, you should use—

(A) parking lights. (B) upper beam of headlights. (C) lower beam of headlights.

_____38. A closed fist thrust upward from the shoulder several times means to—

(A) shift to higher gear. (B) increase space between vehicles. (C) load vehicles. (D) increase speed.

_____39. The person loading a vehicle is responsible for its safety until the destination is reached.

(A) true. (B) false.

_____40. An Army vehicle is normally operated in—

(A) low range. (B) high range.

_____41. For a given speed on the road, the engine runs faster in low range than in high range.

(A) true. (B) false.

_____42. The brake should be applied "off and on" when used in descending a long grade.

(A) true. (B) false.

_____43. Extending the left arm horizontally and describing small circles toward the front means to—

(A) increase speed. (B) close up. (C) make a right turn. (D) pass and keep going.

_____44. When the gas tank is being filled, sparks from static electricity are most likely to occur if the nozzle is held in contact with the tank.

(A) true. (B) false.

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_____45. The air filter prevents dust from getting into the oil in the crankcase.

(A) true. (B) false.

_____46. Three long blasts of a whistle repeated several times indicates—

(A) approach to motor park. (B) dangerous hill ahead. (C) grave danger. (D) desire to pass.

_____47. The track adjustment on a half-track should be checked—

(A) monthly. (B) every 250 miles. (C) daily. (D) every 6 months.

_____48. During freezing weather, all water may be drained by opening the petcock at the bottom of the radiator.

(A) true. (B) false.

_____49. In installing a track that has been removed, the wide part of the track guide should enter the sprocket first.

(A) true. (B) false.

_____50. Trip tickets should be turned in—

(A) at the end of the day. (B) once a week. (C) at the conclusion of the trip.

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Test Answers

A 1.	B 14.	B 27.	B 40.
B 2.	A 15.	A 28.	A 41.
C 3.	D 16.	B 29.	A 42.
B 4.	A 17.	B 30.	D 43.
A 5.	B 18.	B 31.	B 44.
B 6.	C 19.	A 32.	A 45.
B 7.	B 20.	D 33.	C 46.
A 8.	B 21.	A 34.	C 47.
A 9.	B 22.	B 35.	B 48.
B 10.	B 23.	C 36.	B 49.
B 11.	B 24.	C 37.	C 50.
A 12.	A 25.	D 38.	
A 13.	B 26.	B 39.	

47. Vehicle Inspection Test

One or more vehicles are prepared with about five defects and five items missing, such as one headlight not working, missing fire extinguisher, track out of adjustment, oil low in crankcase, underinflated tire, or loose fan belt. The student to be tested is given the following instructions: "You are to make an inspection of a half-track vehicle. Assume you know nothing about the previous use of the vehicle but have been asked to drive it on a 200-mile trip. Perform the Before-Operation Service (WD Form No. 48) from memory and report to me." Ask the driver to list the defective and missing items after he has completed his check. If he omits any, ask him to make a second check. A second omission is cause for failure on the test.

48. Road Test

a. Study the road test checklist. Before beginning the test, carefully work out the necessary route and procedure, so that a maximum of testing may be done in a minimum of time; at least 20 minutes should be allowed for each man to be tested. A half-track vehicle is required for this purpose. The first part of the test course should be straight and level to allow the driver to become familiar with the operation of the vehicle. Every time an error is made, it should be noted on the checklist. In some cases a given item may be checked several times during the course of the test.

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b. CHECK LIST. (1) Following is a suggested "road test check list."

Name _____ Serial Number _____
Organization _____ Date _____

Road Test Check List

Point score _____ Final rating: 1 2 3 4 5

Weight		
		Starting vehicle (O. K. _____).
1	1.	Starts engine with gears engaged.
1	2.	Starts engine with clutch engaged.
1	3.	Fails to release handbrake.
1	4.	Kills engine in starting.
4	5.	Jerks in starting.
		Stopping on level (O. K. _____).
1	6.	Engine not used for braking.
1	7.	Jerks in stopping.
		Use of controls (O. K. _____).
4	8.	Does not double clutch when necessary.
3	9.	Strains engine.
1	10.	Rides clutch.
1	11.	Clashes gears.
1	12.	Uses brake excessively.
1	13.	Tries over 1, shifting 4th to 3rd.
1	14.	Tries over 1, engaging f. w. d.
1	15.	Tries over 1, engaging low range.
		Hand signals (O. K. _____).
1	16.	Not given for STOP.
1	17.	Not given for RIGHT TURN.
2	18.	Not given for LEFT TURN.
		Stop signs (O. K. _____).
1	19.	Goes through 0 to 5 mph.
2	20.	Goes through over 5 mph.
		Driving on hills (O. K. _____).
4	21.	Goes up in wrong gear.
2	22.	Stops to shift while going up.
3	23.	Stalls engine while starting on hill.
3	24.	Jerks in starting on hill.
2	25.	Rolls back over 1 foot in starting.
1	26.	Coasts driving down hill.
3	27.	Coasts backing down hill.
		Driving through mud (O. K. _____).
1	28.	Engages f. w. d. late.
2	29.	Fails to use f. w. d.
2	30.	Stops while in mud.
		Steering (O. K. _____).

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1	31.	Fails to keep to right.
1	32.	Drives off road.
1	33.	Cuts corners.
1	34.	Swings wide on turns.
		Parallel parking (O. K._____).
2	35.	Backings over 1.
1	36.	Markers or curb hit.
1	37.	Left wheels outside (feet).
		Backing to platform (O. K._____).
1	38.	Backings over 1.
1	39.	Feet over 1 from platform.
1	40.	Markers or platform hit.
		Miscellaneous.
1	41.	Speed excessive for conditions.
20	42.	Accident.
10	43.	Near accident.
3	44.	General rating: 1 2 3 4 5

Years of driving experience_____ Miles last year_____

Driving of 1½-ton truck or heavier — Civilian (yrs)_____ Army (hrs)_____

Hours of driving type of truck used for test_____

Comments:_____

Examined by_____

(2) The check list is based on errors most likely to be made by a driver of an Army vehicle. The elements have been selected which are the best indicators of general driving ability. The items have been weighted in terms of their correlation with general driving ability. In giving the test a check mark is recorded each time an error is made or repeated. Obviously, careful judgment by the examiner is of greatest importance.

c. Suggested Procedure for Road Test. (1) *Starting vehicle.* (*a*) Before the driver gets into the half-track to take the test, the hand brake should be set, the ignition turned off, the transmission engaged, the front wheel drive disengaged, and the transfer case placed in high range.

(*b*) Ask the driver to start the engine and proceed down the road. Place a check mark before items 1 to 5 for any error made. Each time any of these errors are repeated use additional check marks. By the time the test is completed some items may have a large number of check marks.

(2) *Stopping on the level.* At some place in the course ask the driver to come to a stop. Check item 6 if the clutch is depressed be-

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fore the brake so that the engine is not used for braking. Check item 7 if a jerk is made.

(3) *Use of controls.* (*a*) The coordination of the driver in the manipulation of brake, clutch and gear shift, is observed throughout the test and checks made when errors occur. Check item 8 if the driver has trouble in shifting because he does not double clutch when necessary. If on a heavy pull, the driver strains the engine instead of shifting to a lower gear, check item 9. Check the other items each time an error is made. Some time during the test when the half-track is in 4th gear ask the driver to shift to 3d. If the shift is made on the first try, do not check item 13. However, if the driver must try more than once, use a check mark for each try in excess of 1. If the gears are clashed, check item 11.

(*b*) At another part of the course ask the driver to engage front wheel drive and at still another place ask him to shift to low range. Use a check mark for each try necessary in excess of 1.

(4) *Hand signals.* The test route should include at least three right and three left turns. Check items 16, 17, and 18 each time a signal is not given. If signals are given improperly, make a note under "Comments."

(5) *Stop signs.* The route should include at least two stop signs. Check item 19 if a complete stop is not made.

(6) *Driving on hills.* If the terrain permits, part of the course should include steep hills and mudholes. If the driver must stop to shift while going up, check item 22. When part way up a hill, have the driver stop, shut off the engine, then start it again and proceed up the hill. Check items 23, 24, and 25 for errors made in starting. Ask the driver to back part way down a hill. If the driver does not use reverse gear, check item 27.

(7) *Driving through mud.* If the driver fails to engage front wheel drive before getting into mud, check item 28. Check item 29 if front wheel drive is not used even though the driver gets through the mud. If the driver has to stop while in the mud for any reason, check item 30.

(8) *Steering.* Observe the steering throughout the test and check each time an error is made.

(9) *Parallel parking.* Mark off a space with lines for parallel parking, 8 feet wide and 6 to 10 feet longer than the half-track from bumper to bumper. Use a log for a curb if one does not exist. Use 5-foot posts or stakes set in kegs filled with dirt to mark the ends and corners of the space. Do not allow over three backings. Check item 35 for each backing over 1, item 36 each time a marker or the curb is hit, and item 37 once for each foot the wheels or tracks are outside the 8-foot limit line when parking is completed. Count the left wheel or track that is farthest out of the parking space.

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(10) *Backing to platform.* Mark off a space 10 feet wide and extending 20 feet from a loading platform. Use posts or stanchions to mark the edges. Check item 36 for each backing required in excess of 1. Check item 40 each time a marker or the platform is touched. When the driver is parked, measure the distance from rear bumper to platform. Place 1 check mark for item 39 for each foot in excess of 1. If the vehicle is 3 feet away, use 2 check marks.

(11) *Miscellaneous.* Check these items each time they occur. Circle one of the figures after item 44, giving a general estimate of the driver without regard to individual items; 1 is very good, 3 is average, and 5 is failure.

d. Scoring Road Test. The "point score" is the sum of the check marks multiplied by their weightings. For example, item 9 checked twice would count 6 points. For item 44, multiply the rating by 5. A rating of 4 would thus count 20 points. The addition of all points from items 1 to 44 will give the point score. After a number of drivers have been tested a scale should be worked out so that a "final rating" can be given on the basic of the point score. A rating of 1 includes the best drivers—those with the lowest point scores. Any driving faults not included in the check list should be listed under "Comments." As an educational measure, the various driving faults are explained to the driver at the conclusion of the test.

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CHAPTER 6

FULL-TRACK VEHICLES

Section I. MECHANICAL PRELIMINARY TRAINING

49. Objective

a. The objective of this phase of training is to give the driver sufficient knowledge of the nomenclature and functioning of the vehicle installations and major units and the characteristics of the vehicle so that he will be able to operate and maintain it intelligently. It is impossible to develop and maintain efficient drivers unless they are throughly grounded in these basic subjects. It is just as important for a driver to know the nomenclature and functioning of his vehicle and its characteristics before he starts actually driving as it is for a machine gunner to know the nomenclature and functioning of his weapon before going on the range to fire. Thorough ground work in these subjects will save much time and wear on equipment when the driver starts actually operating a vehicle. *He must know enough of the functioning of the major units to be able to recognize and prevent vehicle abuse, and to know why, when and how to perform first echelon maintenance.*

b. Use of Manuals. Because of the variety of standard full-track vehicles in use, this manual gives no specific instruction on any one of them. Instructors use the Technical Manual and Field Manual for the vehicle concerned.

50. Tank Characteristics and Assemblies

The objective of this instruction is to teach the capabilities and limitations of the vehicle which concern the driver and to teach him the nomenclature, functioning, and first echelon maintenance of the vehicle assemblies. Give a short conference on the vehicle characteristics and location and maintenance of assemblies then give each student a sheet on which the installations are listed. Divide the students into groups of four with an assistant instructor and one vehicle for each group. Have the assistant instructor point out the assemblies on the

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vehicle, explain and demonstrate its functioning, and the first echelon maintenance required to each of his students.

51. Tracks and Suspension

Teach the nomenclature, function, and first echelon maintenance of the tracks and suspension in a conference, using a tank or a chart to point out the various units, their construction, maintenance and adjustments required. Then divide the students into groups of four with an assistant instructor and one vehicle for each group. Have the students make the inspections of the track and suspension, break the track, connect the track, and make a track adjustment.

52. Power Train

The students are taught the location, functioning, and first echelon maintenance of the power train units. Enough of the functioning of units must be taught so that the students will be able to operate and maintain them properly. Construct simple charts to be used in explaining the functioning of the clutch, transmission, controlled differential and final drive. In explaining the clutch and clutch linkage take the students to the shop and show them a clutch which has been disassembled. On the controlled differential, remove the inspection plate, break both tracks on the vehicle, and using the engine to drive the controlled differential, explain its functioning to the student. Explain and demonstrate first echelon maintenance required.

53. Engine

Teach enough of the functioning of the engine so that the students will be able to recognize and prevent vehicle abuse. By the use of simple charts and drawings, explain the principle of operation of an internal-combustion engine. Then by the use of charts, drawings, and the engine itself, apply this principle to the actual operation or functioning of this engine. During the instruction, stress the effects on the engine of improper operation, such as lugging, operating at too high RPM, too high temperature, low oil pressure, and failure to warm the engine up. Explain and demonstrate the first echelon maintenance of the engine and engine accessories.

54. Electrical System

The student learns the locations and functions of the electrical units, first echelon maintenance required, and the trouble shooting and repair a driver is required to make. Divide the students into groups of four with one assistant instructor and one vehicle for each group. Have the assistant instructor point out the location and explain the operation and maintenance on units such as battery, auxiliary generator, switches, fuse box, and wiring conduits.

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55. Gyrostabilizer, Power Traversing Mechanism, Fire Fighting Equipment, Radio Installation, and Vision Devices

As applicable, explain each unit briefly. Divide students into groups of four, with one instructor and one vehicle for each group. Have the assistant instructor point out the location of each of these units and explain and demonstrate the operation and maintenance required for each.

56. Instruments and Controls

This instruction covers the locations, proper readings, and meaning of the readings of each of the instruments, the importance of constantly observing the instruments, and actions to be taken in case of abnormal readings. The location and operation of the controls are shown. Explain these in a conference and then divide the students into groups of four with one assistant instructor and one vehicle for each group. Have the assistant instructor point out each of the instruments and its correct reading, and what would be considered an abnormal reading. Also point out each of the controls and explain how to operate them.

57. Starting, Warm Up, Cooling Off, and Stopping the Engine

Teach proper position of the driver in the vehicle, and the correct procedure in starting, warming up, cooling off, and stopping the engine. Explain the importance of following this procedure. Cover this subject in a conference, then divide the students into groups of four with one assistant instructor and one vehicle for each group and have them practice the procedures explained in the conference.

58. Maintenance

a. First Echelon. The maintenance performed by the crew, the frequency with which it is performed and the importance of performing it thoroughly, are taught here. Explain in conference, before operation, during operation, at halt, after operation, and weekly maintenance. Divide the students into vehicle crews and have them actually perform all of the first echelon maintenance operations under the supervision of an assistant instructor.

b. Second Echelon. The objective of this instruction is to familiarize the student with the driver's part in 2nd echelon maintenance of his vehicle. Explain that the driver accompanies the vehicle when it receives 2nd echelon maintenance and may actually perform such work under the supervision of unit maintenance personnel. Show how inefficient drivers can overload the entire maintenace system (AR 850–15).

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59. Crew Drill

In this the student learns to perform first echelon maintenance as a part of the vehicle crew in formal parks formations. Prepare cards listing the duties of each of the crew members as prescribed in the Field Manual. Give one of these cards to each of the students, and explain each of the duties listed. Then divide the students into crews with one assistant instructor and one vehicle for each crew. Assign each student the duties of one of the members of the crew and have them go through the crew drill. After they have gone through the crew drill have the members of the crew rotate until each has performed the duties of all members of the crew. Repeat this until they are proficient.

60. Stowage

Explain the principles of tank stowage, that tank stowage is prescribed by the technical manual for the vehicle or by the organization commander. Since a tank or gun motor carriage is a fighting vehicle, stowage must never be allowed to interfere with the rotation of the turret, access to controls, instruments or ammunition, or with the use of vehicle armament.

Section II. FLAT TERRAIN DRIVING

61. Objective

a. The objective of flat terrain driving is to familiarize drivers with the characteristics of full-track vehicles and teach correct driving habits under relatively easy conditions. Good basic driving form so acquired makes more difficult operations easier to learn later on.

b. Flat terrain driving is one of the most important phases of driver training. In it drivers acquire habits to which they cling all through their careers. Therefore, driving instructors and assistant instructors carefully study the objectives described for each exercise, understand these thoroughly, and make them understood to student drivers.

62. Exercises

Each of the exercises in the flat terrain phase is listed below with a description of the exercise, its objective, the course required, special instructions on its conduct, and a list of points to be checked by the instructor. Each of these exercises is planned for units of 10 students, using five vehicles, or two students per vehicle. If there are more than 10 students, organize additional units instead of trying to use more vehicles and more students in each unit. In each of the exercises use the coach and pupil method. In tanks the coach rides in the turret.

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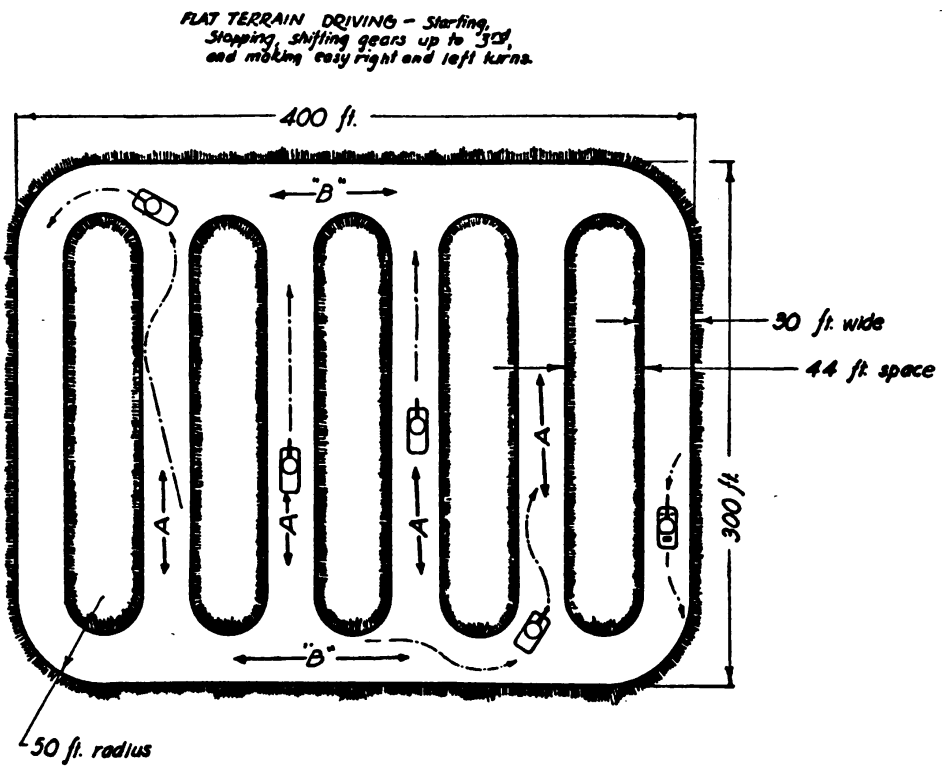


Figure 2. Full-track driver training course.

Give each of the students an instructor's check sheet as a guide in observing for correct procedures. Explain clearly that the speed of a vehicle is governed largely by gear selection and very little by the engine speed as in a wheeled vehicle. The rpm remains approximately the same for all gear positions. There is one assistant instructor with each vehicle to explain how the exercise is to be conducted and its objective, to demonstrate the execution of the exercise, and to critique the exercise during and after its performance. Give the student who is acting as coach an opportunity to express his observations when the exercise is completed. Each exercise is repeated until both students are proficient.

a. Exercise No. 1. (1) *Description.* Move forward in first gear, stop, move in reverse and stop.

(2) *Objective.* To teach putting the vehicle into motion smoothly and confidently; the correct coordination of clutch and accelerator movements; putting the vehicle in motion without lugging the engine and slipping the clutch; stopping smoothly, disengaging the clutch at the right instant, and applying steering brakes correctly.

(3) *Set-up.* Runways "A" (fig. 2).

(4) *Conduct.* The assistant instructor and the two students are mounted in the vehicle, the assistant instructor in the assistant driver's seat. The unit instructor moves from place to place, supervising all

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five vehicles. The instructor explains the objective and execution of the exercise and demonstrates. The vehicles are moved back and forth on the runways in first and reverse gears until all students are proficient.

(5) *Instructor's check list.* The instructor checks to see that the student—

(*a*) Maintains correct engine speed when starting to move forward.

(*b*) Engages clutch smoothly or without jerking.

(*c*) Fully releases clutch after vehicle starts to move.

(*d*) Stops smoothly.

(*e*) Disengages clutch at correct instant when stopping.

(*f*) Shows confidence and obtains smoothness of operation.

(*g*) Observes instruments.

b. Exercise No. 2. (1) *Description.* Steering. Make easy right and left hand turns while driving in first and reverse gear.

(2) *Objective.* To teach coordination of steering lever, and accelerator; to give the student the feel of how much pressure is needed to make a turn, and the amount the accelerator must be depressed to maintain engine speed.

(3) *Set-up.* The same as for Exercise No. 1.

(4) *Conduct.* The assistant instructor is dismounted to give hand signals for turns. The vehicles are moved back and forth in first and reverse on runways "A", figure 2. The students make easy turns from one side of the runway to the other. The assistant instructor explains and demonstrates the exercise before the student attempts it.

(5) *Instructor's check list.* The instructor checks to see that the student—

(*a*) Releases steering levers fully when not turning.

(*b*) Applies pressure to steering levers intermittently, instead of maintaining steady pressure.

(*c*) Maintains engine speed while turning. Does not lug or kill engine.

(*d*) Observes instruments.

(*e*) Shows confidence and smoothness.

c. Exercise No. 3. (1) *Description.* Shifting from second to third gear. Start the vehicles moving forward in second gear, shift to third and execute smooth stop.

(2) *Objective.* To teach the correct coordination of clutch, accelerator, and gear shift movement in executing a smooth up-shift from second to third.

(3) *Set-up.* This exercise is executed on runways "A," figure 2. One vehicle is on each runway with an assistant instructor and two students in each vehicle.

(4) *Conduct.* The assistant instructor explains the objective of the exercise, how it is executed and then demonstrates a smooth up-

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shift, calling attention of students to the engine RPM at which the shift was started. Then with one of the students at the controls, and the assistant instructor mounted in the assistant driver's seat, the vehicle is started at one end of the runway in second gear, shifted to third, and stopped smoothly. As the driver approaches the end of the runway, he stops and dismounts. He then acts as guide while the vehicle is turned around by the instructor. The other student then takes the controls and executes the exercise.

(5) *Instructor's check list.* The instructor checks to see that the student—

(*a*) Starts the shift at the correct engine RPM.

(*b*) Finishes shift without undue delay.

(*c*) Does not lug engine.

(*d*) Does not slip clutch after shifting while gaining speed.

(*e*) By proper coordination of clutch and accelerator accomplishes smooth shift.

(*f*) Does not clash gears.

(*g*) Observes instruments.

(*h*) Shows confidence and smoothness.

d. Exercise No. 4. (1) *Description.* Steering in third gear on a flat, level, marked course.

(2) *Objective.* To teach the student to make right and left turns while maintaining engine speed by correct use of the accelerator, and to stress the timing and amount of movement of accelerator needed to maintain this speed.

(3) *Set-up.* Five vehicles with two students and one assistant instructor mounted in each, operating around runway "B", figure 2.

(4) *Conduct.* The assistant instructor explains the objective of the exercise, how it is to be executed, and demonstrates to the students. Then with one of the students at the controls the vehicle moves around the course, alternately taking the track to the right and to the left.

(5) *Instructor's check list.* The instructor checks to see that the student—

(*a*) Applies steering levers intermittently while turning.

(*b*) Stays on course.

(*c*) Maintains engine speed on turns.

(*d*) Turns correctly and gradually.

(*e*) Allows steering levers to remain all the way forward when not in use.

(*f*) Observes instruments.

(*g*) Shows confidence and smoothness.

e. Exercise No. 5. (1) *Description.* Shifting down from third to second on a flat, level, straight course.

(2) *Objective.* To teach the execution of a smooth down-shift from third to second, stressing the coordination of clutch and acceler-

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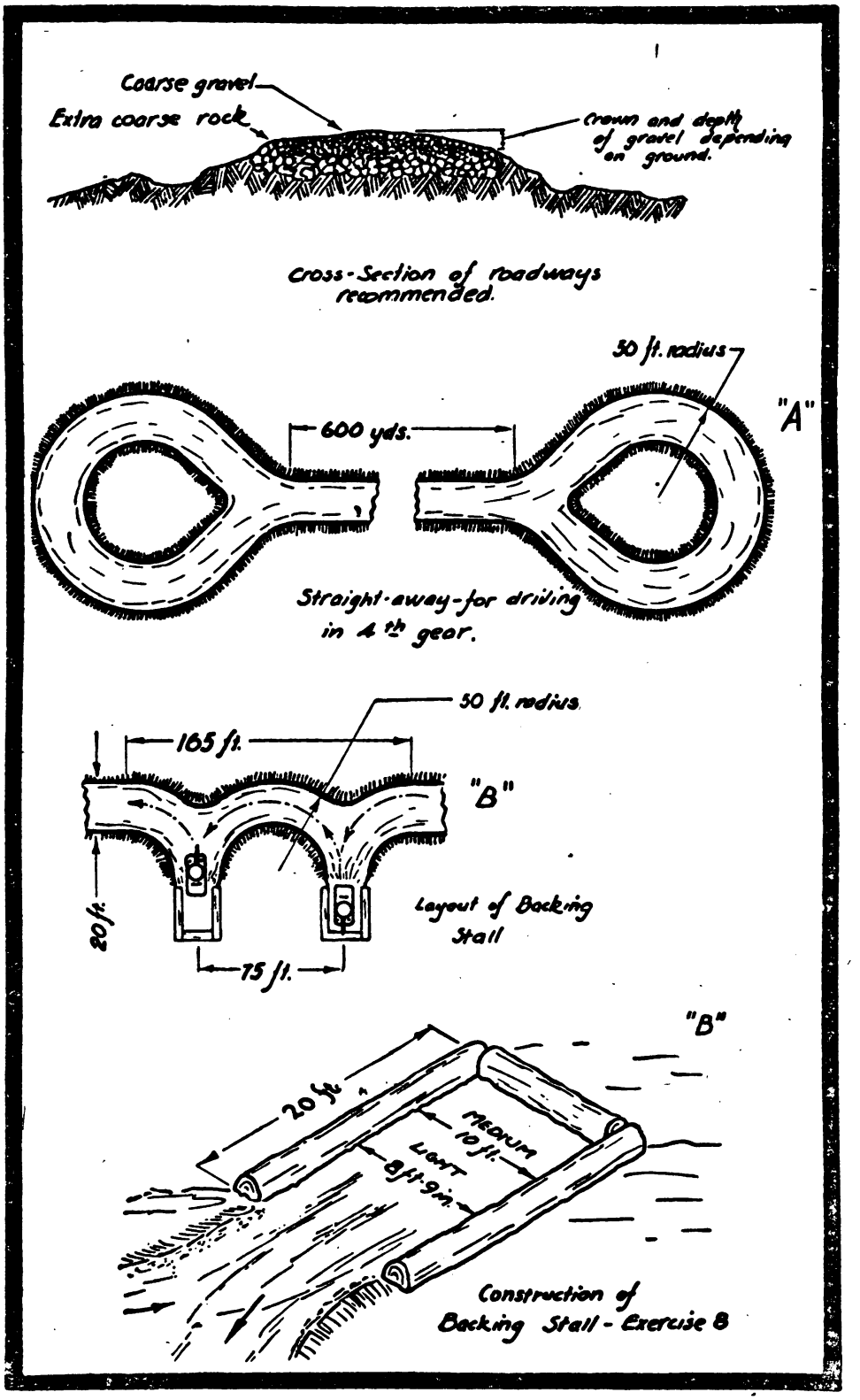


Figure 8. Full-track vehicle driver training course.

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ator, double clutching and the relative engine and vehicle speeds in the two gears.

(3) *Set-up.* The exercise is conducted on Course A, figure 2, with two students and an assistant instructor in each vehicle.

(4) *Conduct.* The assistant instructor explains the objective and how the exercise is executed. He then demonstrates a smooth shift from third to second. The student is then placed at the controls and drives the vehicle in second gear just under maximum operating RPM, observing the speed of the vehicle and the sound of the engine. He shifts into third gear and drives at the same speed long enough to get the feel of the vehicle at that speed in third. This is repeated until the student can assume this speed in either second or third readily. Then while driving in third gear at just below maximum speed for second gear, the student double clutches and shifts down into second. Make sure he depresses the accelerator before releasing the clutch, after shifting into second so the vehicle will not jerk or buck. When all of the vehicles reach the end of the course, start them back singly in the opposite direction.

(5) *Instructor's check list.* The instructor checks to see that the student—

(*a*) Starts shift at proper speed.

(*b*) Proper clutch-accelerator coordination.

(*c*) Completes shift in reasonable time.

(*d*) Does not attempt to shift too fast.

(*e*) Double clutches properly.

(*f*) Uses clutch and accelerator smoothly, preventing vehicle from bucking or jerking.

(*g*) Does not clash gears.

(*h*) Observes instruments.

(*i*) Shows confidence and smoothness.

f. Exercise No. 6. (1) *Description.* Shifting up to fourth on flat level terrain.

(2) *Objective.* To teach smooth up shifting from second through third to fourth gear. The same coordination is required as in shifting from second to third but the student must get the feel of the correct vehicle speed at which the shift is started.

(3) *Set-up.* Same as for exercise No. 5, using Course A, figure 3.

(4) *Conduct.* The assistant instructor explains the objective and how the exercise is to be executed. He demonstrates by starting in second gear and shifting up through third to fourth gear. One of the students then starts in second gear, shifts to third and then to fourth gear. After completing the shift to fourth, the student executes a smooth stop and repeats the procedure. When all of the vehicles reach the end of the course, they are turned in the opposite direction and the exercise is repeated until each student is proficient.

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(5) *Instructor's check list.* The instructor checks to see that the student—

(*a*) Starts the shift at the correct engine rpm.

(*b*) Finishes shift without undue delay.

(*c*) Does not lug engine.

(*d*) Does not slip clutch after shifting while gaining speed.

(*e*) By proper coordination of clutch and accelerator accomplishes smooth shift.

(*f*) Does not clash gears.

(*g*) Observes instruments.

(*h*) Shows confidence and smoothness.

g. Exercise No. 7. (1) *Description.* Down-shifting from fourth to third, third to second, and executing smooth stop.

(2) *Objective.* To make the student proficient in judging the speed at which a down-shift should be made, and in attaining coordination between clutch, accelerator, and shift lever.

(3) *Set-up.* Two students and one assistant instructor to each vehicle on Course "A," figure 3.

(4) *Conduct.* The assistant instructor explains the objective, how the exercise is executed, and demonstrates a smooth down-shift from fourth to third, and third to second, and stops. Then, the student starts in second, shifts to third, and operates at just under maximum speed in third gear until he becomes familiar with the feel of the vehicle at this speed. He shifts into fourth, operates at the same vehicle speed as when in third gear, and notes the relation between the engine RPM and vehicle speeds in the two gears. With the vehicle in fourth gear and operating at just under maximum speed for third gear, the student double clutches and shifts into third gear, being careful to use his accelerator so that the vehicle does not buck or jerk when he releases the clutch after completing the shift.

(5) *Instructor's check list.* The instructor checks to see that the student—

(*a*) Starts shift at proper speed.

(*b*) Proper clutch-accelerator coordination.

(*c*) Completes shift in reasonable time.

(*d*) Does not attempt to shift too fast.

(*e*) Double clutches properly.

(*f*) Uses clutch and accelerator smoothly, preventing tank from bucking or jerking.

(*g*) Does not clash gears.

(*h*) Observes instruments.

(*i*) Shows confidence and smoothness.

h. Exercise No. 8. (1) *Description.* Shifting up to fifth gear and executing smooth stop.

(2) *Objective.* Same as for Exercise No. 6.

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(3) *Set-up.* Same as for Exercise No. 6.

(4) *Conduct.* Follow the same method as for Exercise No. 6.

(5) *Instructor's check list.* Same as for Exercises Nos. 3 and 6.

i. Exercise No. 9. (1) *Description.* Shifting down from fifth to fourth, fourth to third, third to second and executing smooth stop.

(2) *Objective.* Same as for Exercise No. 7.

(3) *Set-up.* Same as for Exercise No. 7.

(4) *Conduct.* Same method as used in Exercise No. 7. Give the student enough driving in fourth at just under the maximum speed for him to get the feel of the vehicle. Then have him drive at this same speed in fifth and shift down to fourth.

(5) *Instructor's check list.* Same as for Exercise No. 7.

Section III. INTERMEDIATE DRIVING

63. Objective.

The objective of intermediate driving is to develop the fundamentals of seeing, judging, and manipulating. The students drive over simple obstacles, in restricted space, and over gently rolling terrain. In this phase of driving the student develops his feel of the vehicle. If he can cross simple obstacles correctly, judge distance and width well enough to perform precision driving, ascend and descend the hills, and shift up and down correctly on rolling terrain, he will have no trouble when he attempts the more difficult obstacles in cross-country driving. Pay close attention to developing the highest skill in the details of each of the exercises. Use the instructor's check sheet and correct all errors right on the spot. Students form incorrect habits very easily in this stage of training unless the assistant instructors are alert, know the objective of each exercise, and miss no errors made by the student. It is just as important for the student to know the objective and how the exercise is to be performed as for the instructor.

64. Exercises.

The same general principles govern the conduct of exercises as for flat terrain driving. The exercises for intermediate driving are listed below:

a. Exercise No. 10. (1) *Description.* Simple obstacle in elevation and depression.

(2) *Objective.* To teach the correct timing and coordination of the clutch, accelerator and brakes when crossing simple obstacles and to give the student the feel of the balance of the vehicle and when to make each of the manipulations called for in crossing these obstacles.

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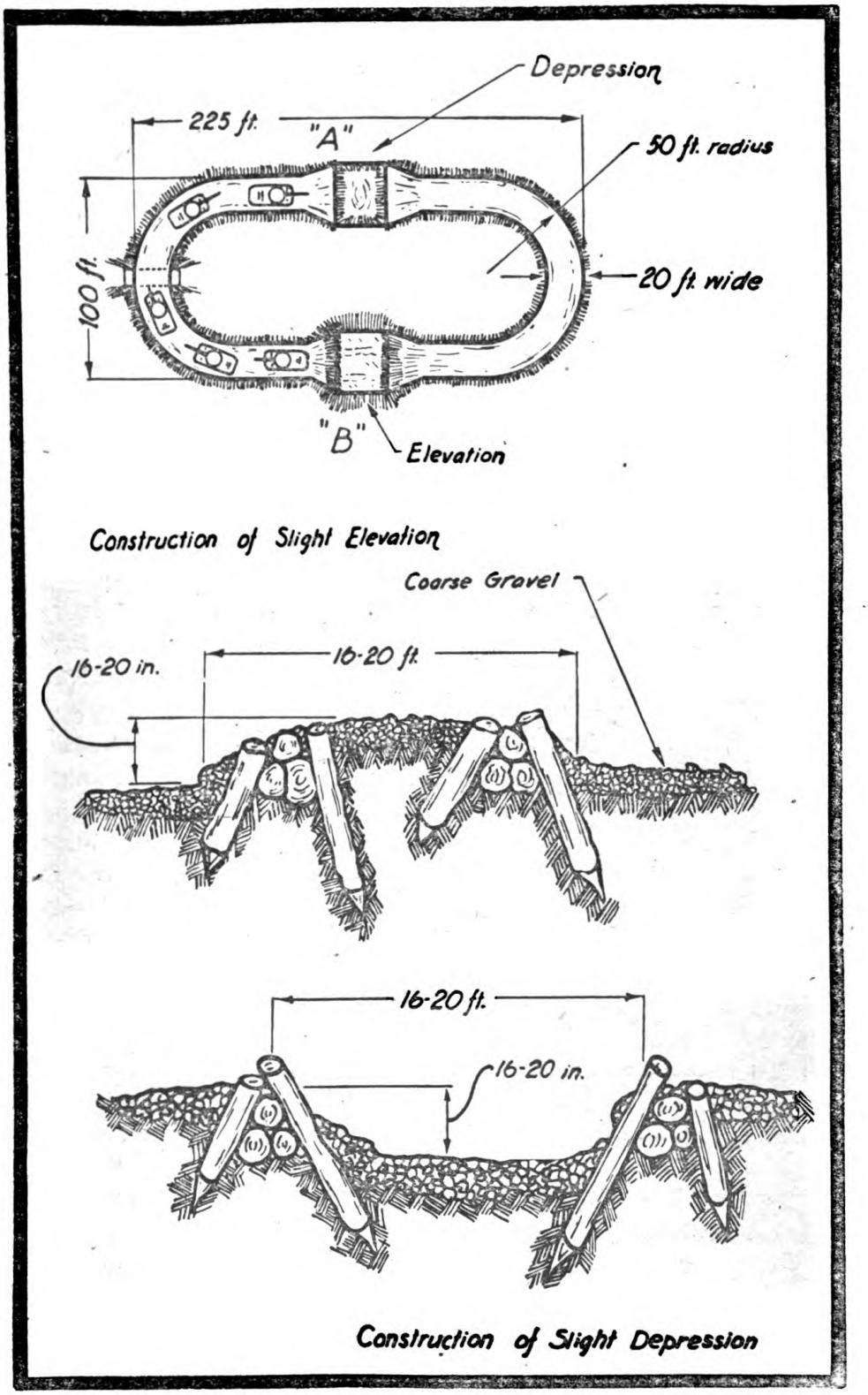


Figure 4. Full-track vehicle driver training course; intermediate driving.

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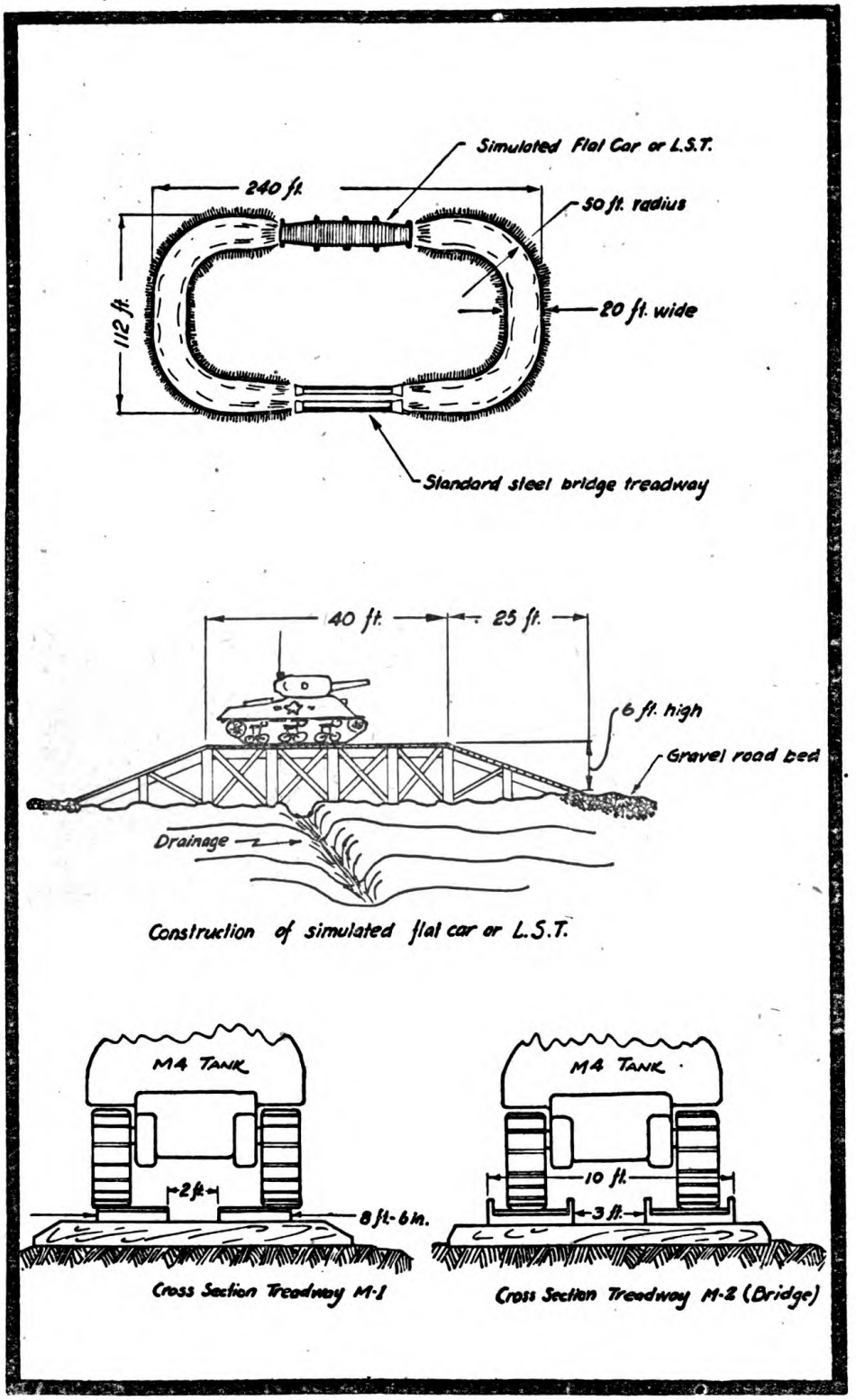


Figure 5. Full-track vehicle driver training course; intermediate driving.

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(3) *Set-up.* Five vehicles with two students and one assistant instructor for each vehicle. Exercise to be executed on course shown in figure 4.

(4) *Conduct.* The assistant instructors explain the objective, how the exercise is to be executed and demonstrate the crossing of each of the obstacles. Each assistant driver takes his place in the assistant driver's seat of his vehicle. The instructor moves to a position near obstacle A. The vehicles are assembled in close column in front of obstacle "A." One of the students crosses the obstacle and proceeds to a point in front of obstacle "B." After all the vehicles have taken obstacle "A" and closed in column on the first vehicle, the students are dismounted and a critique is held on the points listed on the instructor's check sheet. The same procedure is followed in crossing obstacle "B." Have each student cross the obstacles, checking and critiquing after each crossing until all students are proficient.

(5) *Instructor's check list.* The instructor checks to see that the student—

(*a*) Use proper timing in use of clutch, accelerator, and brakes.
(*b*) Does not slip clutch.
(*c*) Maintains proper engine speed.
(*d*) Obtains smooth operation over obstacle.
(*e*) Observes instruments.
(*f*) Shows confidence and smoothness.

b. Exercise No. 11. (1) *Description.* Precision driving.

(2) *Objective.* To teach the student to judge distances, obey signals, and drive his vehicle exactly where he wants to, in a restricted space.

(3) *Set-up.* Five vehicles with two students and one assistant instructor for each vehicle. The exercise is executed on Course shown in figure 5 and Course "B" in figure 3.

(4) *Conduct.* The assistant instructor explains the objective and how the exercise is executed. Place each vehicle at one of the stations and have the students practice backing and pulling into or on the desired locations. Rotate the students when the first has become proficient. When each student becomes proficient on his station, rotate the vehicles between stations. Continue until each student is proficient on each station.

(5) *Instructor's check list.* The instructor checks to see that the student—

(*a*) Obeys signals promptly.
(*b*) Stays between guide posts when backing or pulling into stall.
(*c*) Hits treads of simulated treadway bridge.
(*d*) Does not run off ramp.
(*e*) Obeys safety rules when following a dismounted guide.
(*f*) Does not ride or slip clutch.

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c. EXERCISE No. 12. (1) *Description.* Ascent and descent of hills, selected for progressively increasing degrees of slope and amount of required steering.

(2) *Objective.* To teach the student to judge degree of slope and the gear required for ascending and descending various grades.

(3) *Set-up.* Five vehicles with two students and an assistant instructor for each vehicle. Marked courses on hills of various degrees of slope which require a varying amount of steering to negotiate.

(4) *Conduct.* Select and mark four or five courses well in advance of the execution of this exercise. Each course need not be over 150 yards long. Have the students walk over the easiest course, decide what speed and gear to use in ascending and descending it, and when to shift. Then have each student drive over the course, ascending and descending the grade, until he is proficient. When each has mastered this course move to the next, which should be more difficult, and repeat the same procedure. Repeat this procedure until all of the students have mastered the course.

(5) *Instructor's check list.* The instructor checks to see that the student—

(*a*) Selects the proper gear.

(*b*) Does not allow the momentum of vehicle, when descending the hill, to build up too high an engine rpm.

(*c*) Uses combination of brakes and engine to hold speed down while descending hill.

(*d*) Is able to ascend the hill without stopping.

(*e*) Does not lug the engine.

(*f*) Observes instruments.

(*g*) Shows confidence and smoothness.

d. EXERCISE No. 13. (1) *Description.* Driving on marked route over rolling terrain with the hatches open, with hatches closed, and with the driver blind.

(2) *Objective.* To teach the student to estimate grades, select the proper gears and to react promptly and smoothly to varied driving conditions, and to teach him to drive confidently, while unable to see, by taking directions from the tank commander.

(3) *Set-up.* Select and mark a course over rolling terrain which includes no woods, steep hills, mud, sand or ditches. The course should be from 600 to 1000 yards long. Five vehicles are required with two students and one assistant instructor in each.

(4) *Conduct.* Explain the objective and how the exercise will be conducted. Dismount the students and have them walk over the terrain studying and judging each slope. Then mount them in the vehicles and have the assistant instructors demonstrate how the course should be traversed. Next place students at the controls and have them drive over the course. After completing the course or before,

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if necessary, the assistant instructor holds a critique using the instructor's check sheet as a guide. Rotate the students each time they go over the course and repeat the course until each is proficient. After each student is proficient at driving with hatches closed, have him lower the periscope and drive the course, taking directions from the vehicle commander.

(5) *Instructor's check list.* The instructor checks to see that each student—

(*a*) Selects gears.
(*b*) Does not lug engine.
(*c*) Does not exceed maximum R P M.
(*d*) Selects proper vehicle speed.
(*e*) Operates the vehicle smoothly and uses proper clutch-accelerator coordination.
(*f*) Does not clash or force gears when shifting.
(*g*) Does not slip clutch.
(*h*) Does not engage clutch too quickly or in a jerky manner.
(*i*) Watches instruments.
(*j*) Does not ride the steering levers.
(*k*) Shows confidence and smoothness.

Section IV. CROSS-COUNTRY DRIVING

65. Objective

The objective of the cross-country driving phase is to teach the student to apply the skill and knowledge he has learned in the proceeding phases, and to increase his knowledge of the capabilities and limitations of his vehicle. If he has learned well each of the exercises in the flat terrain and intermediate phases, he will have no trouble with cross-country driving. He will have only to use more judgment and react a little quicker in making the required manipulations. Impress upon both the instructor and the student the object of each of the exercises and the particular points to be observed as listed on the instructor's check sheet. Each of the exercises is performed with hatches open until the student is proficient, then with hatches closed.

66. Exercises

The same general procedure is followed for this phase as described in paragraph 62 on flat terrain driving. The exercises of the cross-country driving phases are listed below.

a. Exercise No. 14. (1) *Description.* Learning the vehicle's capabilities and limitations.

(2) *Objective.* To teach the students to recognize terrain and obstacles that their vehicle will take and will not take.

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(3) *Set-up.* Select and mark a course containing various types of terrain and obstacles, such as grades, woods, ditches, mud, sand, stumps, or boulders. Some of these the vehicles will negotiate and some they will not negotiate.

(4) *Conduct.* At the beginning of the course, have the students dismount and walk over the course with the vehicles following them. As they reach each obstacle have them decide whether the vehicle will negotiate it and the best method of approaching and crossing it. Then have one of the vehicles attempt to negotiate the obstacle. Hold a critique on the method used and on why the vehicle negotiated or failed to negotiate the obstacle. Repeat this procedure for each obstacle in the course.

b. EXERCISE No. 15. (1) *Description.* The driver is required to—

(*a*) Drive over vertical obstacles.

(*b*) Drive through woods.

(*c*) Drive through mud and sand.

(*d*) Ascend and descend steep hills; stop, back up and start while ascending and descending steep hills.

(*e*) Ford.

(2) *Set-up.* Five vehicles with one assistant instructor and two students per vehicle. Lay out a course containing each of the types of driving listed in (1) above. The vertical obstacle can be constructed with logs, or a suitable ditch with vertical banks may be used. If a suitable course through woods is not available, a substitute course can be constructed with stakes to represent trees. The grades selected should be of about 25° slope and about 100 to 150 yards long. To avoid possible drowning out of engines, the depth of the ford should be about one foot less than the maximum fording ability of the vehicle. In order to save time in moving from one obstacle to another, have them as close together as practicable.

(3) *Conduct.* At the first obstacle, the assistant instructor explains the objective, how to negotiate the obstacle and demonstrates. The vehicles are assembled in close column, and the students drive them across the obstacle, forming again in close column after crossing it. The instructor holds a critique on each student's performance, using the instructor's check list as a guide. The students rotate on their vehicle after crossing the obstacle. When all students are proficient on one obstacle, move on to the next and repeat the same procedure.

(4) *Instructor's check list.* The instructor checks to see that the student—

(*a*) Approaches the obstacle at the correct speed.

(*b*) Crosses in correct gear.

(*c*) Maintains correct engine speed.

(*d*) Uses clutch, accelerator, and brakes at right time.

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(*e*) Negotiates obstacle smoothly.

(*f*) Shows confidence and smoothness.

c. Exercise No. 16. (1) *Description.* Field expedients to include driving towed and towing vehicles; driving vehicle off of stump by use of log and chains, driving vehicle out of mud with one track anchored with cable and anchor.

(2) *Objective.* To teach the driver the problems of driving a vehicle under the conditions listed in (1) above.

(3) *Set-up.* Five vehicles with one assistant instructor and two students per vehicle. Provide in advance the following: a stump high enough to belly the vehicle; a log to chain between the two tracks and chains for fastening the log to the track; muddy or slick terrain in which a tank will become stuck; a cable; a chain for attaching the cable to the track, and a tree or other anchor for fastening the other end of the cable; and towing cable for each of the vehicles.

(4) *Conduct.* Explain the objective and how the exercise is to be conducted. Have the vehicles alternate towing and being towed until each student has mastered driving under both conditions. Move to the stump. Explain how to drive a bellied vehicle off the stump by the use of a log chained to each of the tracks. Have one of the assistant instructors demonstrate this and then have each of the students drive the vehicle onto and off of the stump. After each of the students has completed this exercise, move to the muddy or slick spot. Explain and demonstrate the exercise, then have the vehicles, one at a time, become ditched. Attach one end of the cable to the track, the other end to an anchor, and by holding back on one steering lever, drive the vehicle out of the mud. Repeat this procedure with each vehicle, then change drivers and repeat until all students are proficient.

(5) *Instructor's check list.* The instructor checks to see that the student—

(*a*) Operates smoothly and with confidence.

(*b*) Does not slip or ride clutch.

(*c*) Operates engine at correct rpm.

(*d*) Promptly obeys all signals.

(*e*) Observes safety rules.

(*f*) Observes instruments.

d. Exercise No. 17. (1) *Description.* Cross-country driving.

(2) *Objective.* To teach the selection of routes from within the vehicle, and the operation of the vehicle across-country over varied terrain.

(3) *Set-up.* Five vehicles with one assistant instructor and two students each. Select a training area which contains various types of terrain, and mark a number of starting points and objectives with a distance of 100 yards or more between the starting point and the objective.

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(4) *Conduct.* At starting point No. 1 and point out objective No. 1. Explain the objective of the exercise. Have each of the students drive over the ground to the objective, selecting what he considers to be the easiest route as he goes. When all of the vehicles have reached objective No. 1, change drivers and repeat the procedure between starting point No. 2 and objective No. 2. Repeat until all students are proficient, holding a critique when each objective is reached.

(5) *Instructor's check list.* The instructor checks to see that the student—

(*a*) Uses clutch-accelerator properly when starting.

(*b*) Does not slip clutch.

(*c*) Does not lug engine.

(*d*) Keeps engine within correct rpm limits.

(*e*) Does not ride clutch.

(*f*) Does not ride steering levers.

(*g*) Shows good judgment in selection of gears, speeds, and routes.

(*h*) Shifts up and down smoothly by proper use of clutch and accelerator.

(*i*) Maintains proper distance and interval with respect to other vehicles.

(*j*) Observes instruments.

(*k*) Shows confidence and obtains smooth operation.

Section V. COMBAT DRIVING

67. Objective

a. The exercises of the combat driving phase are designed to teach the student to drive in formation, select the best tactical routes, use cover and concealment, select and move into firing positions, to cooperate with the vehicle commander and gunner of his own vehicle, and to function as part of the team with other vehicles. A well-trained driver is able to move over to the right route or place his vehicle in the correct position with only brief instructions from the vehicle commander and, in the meantime, be on the alert for indications of mines. This allows the vehicle commander to search out and bring effective fire on enemy targets with minimum distractions. Control of the students in these exercises becomes increasingly difficult but can be maintained by—

(1) Selecting short courses and pointing out easily distinguished rallying points.

(2) Making sure each student understands the exercise before it is started.

(3) Controlling vehicles and issuing instructions during exercises from a ¼-ton truck equipped with radio.

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b. EXERCISE No. 18. (1) *Description.* March to include road and cross-country driving, and moving into and out of a bivouac area.

(2) *Objective.* To teach the student to operate his vehicle properly at various speeds and over varied terrain while maintaining his correct position in column; to teach the selection of positions in a bivouac area and how to move into this position.

(3) *Set-Up.* Select a route which will require both road and cross-country driving and which passes near a suitable bivouac area. Use 5 vehicles with one assistant instructor and two students per vehicle and the necessary traffic control vehicles and road guides.

(4) *Conduct.* Explain the objective, and how the exercise will be conducted. Assemble the students at the motor park and have them perform before operation inspection. Move out of the park and when approximately one-half way to the bivouac area have the students halt and perform at halt inspection. Move into the bivouac area, take up a position for all around defense, and perform after operation maintenance. Move out of the bivouac area, back to the motor park, and perform after operation maintenance.

(5) *Instructor's check list.* The instructor checks to see that the student—

(*a*) Maintains proper distance during march and while moving into and out of bivouac area.

(*b*) Places vehicle to take full advantage of cover and concealment.

(*c*) Selects position that affords good field of fire.

(*d*) Vehicle is on level ground.

(*e*) Avoids excessive tracking and destruction of vegetation.

(*f*) Moves off the road and maintains proper distance at halts.

(*g*) Operates vehicle correctly at all times.

(*h*) Performs inspections and services properly and completely.

c. EXERCISE No. 19. (1) *Description.* Formation driving to include column, wedge, line and echelon, inverted wedge and line of sections.

(2) *Objective.* To teach proper operation of the vehicle while maintaining position in formation.

(3) *Set-up.* Five vehicles with one assistant instructor and two students per vehicle: a training area suitable for formation driving.

(4) *Conduct.* Explain the objective. Use the assistant instructors to demonstrate each of the formations, and then have the students drive, taking up the formations and assuming specified distance on the order of the instructor. Rotate drivers and continue the exercise until all drivers are proficient. Assemble the students frequently for critiques.

(5) *Instructor's check list.* The instructor checks to see that the student—

(*a*) Maintains correct position with respect to other vehicles.

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(*b*) Exercises good judgment in selection of route and speed when moving over rough terrain.

(*c*) Operates vehicle correctly.

d. Exercise No. 20. (1) *Description.* Tactical driving to include assuming turret or hull defilade position, advancing by alternate bounds; selecting and driving over best tactical route; evasive action against AT guns and skip bombing. This is primarily for tanks.

(2) *Objective.* To teach proper operation of the vehicle during tactical exercises.

(3) *Set-up.* Five vehicles with one assistant instructor and two students per vehicle; suitable training area with routes and objectives previously set up.

(4) *Conduct.* (*a*) Point out an enemy installation and have each student move into a hull defilade position from which fire could be brought on the enemy. Check and critique the position and movement.

(*b*) Divide the five vehicles into two sections, appoint one of the students platoon leader, point out an objective and have them advance on the objective by alternate bounds. Rotate the students and hold frequent critiques.

(*c*) Point out the location of an enemy position and have each student select and drive over an approach route affording the best cover and concealment. Hold a critique, rotate the students, and repeat.

(*d*) Point out the position of an enemy AT gun and have each student approach it over open terrain on a zig-zag course. Hold critique, rotate students, and repeat.

(5) *Instructor's check list.* The instructor checks to see that the student—

(*a*) Moves rapidly over open terrain.

(*b*) Avoids unnecessary dust and noise.

(*c*) Exposes no more of his vehicle than necessary when moving into defilade.

(*d*) Places vehicle in position with minimum cant and proper pitch so that guns can be depressed as necessary.

(*e*) Takes advantage of available cover and concealment, utilizing dark backgrounds, shadows and terrain features.

(*f*) Keeps off skyline.

(*g*) Zig-zags while moving to cover from antitank gun.

(*h*) Operates vehicle correctly.

e. Exercise No. 21. (1) *Description.* Night driving under various conditions of terrain and degrees of darkness.

(2) *Objective.* To teach the use of the eyes at night, the difference in appearance of objects at night, and the necessity for quick reactions and extra caution when driving at night.

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(3) *Set-up.* Five vehicles with one assistant instructor and two students each; a previously selected and marked route over roads, trails, and cross-country.

(4) *Conduct.* Assemble the students in the motor park, explain objective, and conduct of exercise. Have students perform before operation inspection. Move out on previously selected route and have one or more scheduled halts during which students perform inspection at the halt. Upon returning to the motor park perform after operation maintenance.

(5) *Instructor's check list.* The instructor checks to see that the student—

(*a*) Keeps vehicle ahead in sight but at a safe distance.

(*b*) Moves to the side of the road during halts.

(*c*) Shows no signs of unsatisfactory night vision or night blindness.

(*d*) Operates vehicle correctly.

f. Exercise No. 22. (1) *Description.* Tactical driving to develop team work and coordination between the driver vehicle commander and gunners. This exercise is primarily for tanks.

(2) *Objective.* (*a*) To teach the driver to select correct routes, targets and positions and to maneuver his tank to afford the best opportunities for the gunners to bring fire on the enemy and to present as poor a target as possible to the enemy.

(*b*) To train the driver to operate with minimum instructions from the vehicle commander.

(3) *Set-up.* Five vehicles with one assistant instructor and two students each; a marked route over rolling terrain with flags along the route representing enemy antitank guns, infantry and tanks.

(4) *Conduct.* Explain to the students the meaning of the various flags; then have each drive over the course and practice the following (when applicable each student practices with hatches both open and closed):

(*a*) Picking up and properly designating targets as they appear.

(*b*) Turning a tank so the bow gunner can fire on the infantry when the tank commander gives the fire order.

(*c*) Driving so the gunner can put moving fire on the enemy antitank gun or tank.

(*d*) Taking a hull defilade position quickly so the gunner can fire on the antitank gun or tank.

(*e*) Moving to an alternate firing position.

(*f*) Using cover and concealment to close with the antitank gun or tank.

(5) *Instructor's check list.* The instructor checks to see that the student—

(*a*) Identifies and correctly designates targets as they appear.

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(*b*) If fire from the moving tank is ordered:

1. Notifies the gunner of any change in direction or when rough ground is ahead.

2. Drives smoothly so as to give the gunner a good firing platform.

3. Takes advantage of cover and concealment.

4. Selects smoothest route.

5. Operates vehicle correctly.

(*c*) If firing from a stationary tank is ordered:

1. Moves quickly to defilade, exposing no more of the vehicle than necessary.

2. Places vehicle in position with minimum proper pitch so that the gun can be depressed as necessary.

3. Makes minimum noise and dust while moving.

Section VI. TRAINING DRIVERS FOR VEHICLES EQUIPPED WITH HYDRAMATIC TRANSMISSIONS

68. General

In training drivers to operate vehicles equipped with hydramatic transmission require them to drive all exercises from both the left and the right side of the compartment. Follow the phases, courses and exercises prescribed for training drivers to operate vehicles equipped with the conventional transmission, with the following exceptions:

a. Flat Terrain Driving. (1) Teach smooth starting and stopping with transfer unit selector lever and transmission selector lever in "LO" position.

(2) Teach easy right and left turns with both selector levers in "LO" position.

(3) Teach the correct speeds at which the selector levers may be shifted.

b. Intermediate Phase Driving. (1) Use the same obstacles and stations for precision driving as shown in figures 3 to 5.

(2) Teach the correct position of the selector levers for taking obstacles.

(3) Teach precautions to be observed in backing up.

c. Cross-Country and Combat Driving. (1) Use the same exercises prescribed for the vehicle equipped with the conventional transmission.

(2) Check for correct use of selector levers, accelerator and steering brakes.

d. Time. Normally it is not necessary to spend as much time on the flat terrain phase of driving with vehicles equipped with the hydramatic transmission. However, the driver is continually reminded that he can, by manipulating the accelerator and selector levers, cause the transmission to shift so as to give maximum performance. Stress the

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precautions and operating procedure listed in technical manuals for vehicles of this type.

Section VII. EXAMINING DRIVERS

69. Objective

The objective is to eliminate men who do not meet minimum requirements, conduct final examinations. These examinations determine which are best qualified to become drivers. In case more students pass the examination that are required for drivers, select the best and hold the others in reserve or make them assistant drivers. The examination eliminates the unfit and classifies the students; a good examination impresses upon them the importance of their jobs. If the examination is handled in a careless and inefficient manner, it results in inefficient drivers.

70. Required Tests

AR 850–15 directs that vehicle operators permits be issued only to individuals who have satisfactorily passed an examination conducted by a qualified commissioned officer covering the following subjects:

a. Driver's Aptitude. This part of the examination is given before training is started.

b. Mechanical Knowledge. Nomenclature and functioning of major units of the vehicle.

c. Operation.

(1) Actual driving of the vehicle, involving use of controls, reversing, and parking under usual conditions of traffic and terrain.

(2) Traffic regulations and road procedure, safety precautions, speed limits and vehicle abuse, and the use of the driver's accident report.

71. Written Examination

Drivers take a written examination. The questions in paragraph 73 apply to any full-track vehicle. The answers vary for different types of vehicles. In grading this examination, subtract one (1) point from the total number of questions for each question answered incorrectly. Minimum passing grade is 21.

72. First Echelon Maintenance Examination

The examination on first echelon maintenance is conducted as follows:

a. Set up several defects on the vehicle that should be discovered by the driver in performing his part of the crew drill. These may be low oil level, loose nuts or bolts, electrical troubles, loose accessories, and any others which he should find during his inspection.

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b. Have the student perform the driver's part of first echelon maintenance.

c. Ask him questions on how he checks various items.

d. Ask him questions on prevention of vehicle abuse, the driver faults or bad habits which cause undue wear, and have him explain the effect of some driver abuses on his vehicle. The questions will vary for different types of vehicles but the following are examples of the questions to be asked:

(1) Explain the effect of riding or slipping the clutch.

(2) What is the result of moving out before the engine is warmed up? Of stopping the engine without properly cooling it off?

(3) What is the maximum and what is the minimum allowable engine RPM in operation?

(4) What are the correct oil pressure and temperature gauge readings?

(5) What is the result of riding the steering levers?

e. Give a grade from 0 to 20 on student's ability to find troubles based on the number of troubles found during the inspection. Give a grade from 0 to 20 on the thoroughness, speed, and efficiency with which he carried out the inspection. Give him a grade of 0 to 20 on his knowledge of how to inspect the item on which he was questioned. Give a grade from 0 to 20 on ability to answer questions on vehicle abuse. Add the three grades together to arrive at the grade for the first echelon inspection. The maximum score is 80 points. The minimum passing score is 56.

73. Practical Driving Examination

a. Give a practical examination on each exercise before the student goes to the next. Using the instructor's check list as a basis, give a grade of from 0 to 10 for each exercise except No. 14. Maximum score is 210 for this test. Minimum passing score is 140. Delete exercises not applicable and make proportional adjustment in score.

b. Grading. Although grades vary with the individual examiners, the system of grading suggested below gives satisfactory results. If the time and facilities are available, an average grade can be determined by giving the examination to a group of drivers proven by experience to be competent. In grading the practical driving examination, the examiner must carefullly consider each check point under the exercise he is grading and base his grade on the number of mistakes made. He must not hesitate to mark the student "unsatisfactory" if he makes enough mistakes to warrant it. The student's final grade on the three examinations is obtained by recording the grades on the driving test sheet and adding them together. Any student who fails to make a grade of 220 (or adjusted score proportionate thereto, see *a* above) or higher is not qualified for an operator's permit.

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TANK DRIVER INFORMATION TEST

(For final qualification)

Instructions

Read each question carefully. On the black line at the left of the question number write T if the statement is true, F if the statement is false.

_____ 1. Racing an engine to warm it up is advisable.
_____ 2. The clutch should be disengaged when the motor is started.
_____ 3. If oil pressure gauge shows zero, it should be reported after reaching motor park.
_____ 4. Driver should disengage clutch while descending grades.
_____ 5. Left turns are made from right lane.
_____ 6. Signal for right turn is: Arm straight out.
_____ 7. Water-pump grease is soluble in water.
_____ 8. Any member of the United States Army is authorized to drive a military vehicle.
_____ 9. A driver may use gasoline to clean his engine.
_____10. A driver is responsible that his vehicle tools are always present, complete, and in serviceable condition.
_____11. A driver, after discovering a mechanical condition injurious to further operation of his vehicle, will continue in column unless ordered to fall out by higher authority.
_____12. A vehicle is backed without signal when no men or vehicles are observed in the vicinity.
_____13. A driver should always know his destination and route before leaving the motor park.
_____14. It is not essential that drivers have a practical knowledge of map reading.
_____15. Arms crossed in front of the body is the signal for cranking motors.
_____16. When a steep grade is to be ascended, shift when the engine starts to lug.
_____17. A safe distance from which to guide the driver when on foot is 3 to 5 yards.
_____18. When towing a vehicle to start it, it should be in high gear.
_____19. To turn a vehicle sharply, the brake lever is pulled back and held lightly.

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_____20. To make a wide turn the brake lever is pulled back and held tightly.

_____21. Before stopping, a tank engine should be cooled by idling.

_____22. During normal operation the hand throttle should be pulled out slightly.

_____23. If an engine is flooded, pump the accelerator and turn the engine over with the starter, ignition off.

_____24. Permitting vehicles to stand overnight with low fuel tanks will allow condensation, resulting in water in the fuel.

_____25. If the vehicle is to be washed and lubricating service performed, lubricate the suspension units after the cleaning is accomplished.

_____26. To move a vehicle short distances when the engine is inoperative, place in low gear and use the starter for short periods.

_____27. Driver checks instruments only while warming up.

_____28. When a vehicle is being towed, the driver's hatch should be closed.

_____29. Disengaging the clutch (holding it in) while the engine is running will cause undue wear on the clutch throw-out bearings.

_____30. If necessary to knock down a reasonably large tree, hit it with the center of the vehicle rather than with a sprocket.

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CHAPTER 7

SUPERVISION OF DRIVERS

74. Necessity

Driver training and examination does not stop with the examination and issuing of the operators permit. In order to maintain driver efficiency, training and examination must be continuous. This continuous training and examination is supervision. Any work not carefully and continually supervised will eventually deteriorate below satisfactory standards. When drivers are not supervised deterioration is rapid. Drivers form one bad habit after another until all of the maintenance facilities will not keep their vehicles off the dead line. Usually a large deadline or an unusually heavy maintenance load can be traced directly to lack of supervision.

75. Requirements

Supervision is one of the main duties of every officer and noncommissioned officer in the Army. In order for anyone to supervise driving he must know how the vehicle should be driven, be able to recognize vehicle abuses, and where and when these abuses are most likely to occur. He must have a definite list of items to check on. He must be at the right place to check these items, and know how to correct the faults he discovers.

76. Use of Check List

a. In Park. A practical method of discovering driver faults and vehicle abuse is to use the instructors check list as a guide and spot check the drivers before, during and after a march or exercise. While these vehicles are warming up, observe for correct warm-up procedure and question the drivers on correct engine RPM; length of warm-up period; normal readings of instruments, first echelon maintenance and the drivers during operation inspection. Make a note of any deficiencies found so that the driver can be given instruction on the subjects he is weak in at the first opportunity.

b. During March. During the march or exercise, ride the column in a ¼-ton truck or other light vehicle and observe for correct speeds, gear selection, and smoothness in clutch, accelerator and gear shift

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use. A vehicle which is being driven correctly will not rock and pitch when the driver is shifting gears. Take the number of any vehicle that is being operated improperly and give the driver additional instruction upon completion of the march or problem.

c. CRITIQUE. Finally, check the cooling off and stopping procedure upon returning to the motor park and correct any deficiencies noted. As soon as possible assemble all drivers who were discovered operating their vehicles improperly and give them individual instruction to correct their driving faults.

77. Periodic Examination

a. NECESSITY. Drivers who apparently are competent will form bad habits which may not be apparent from observation of their driving. For this reason it is essential to hold periodic drivers tests and examinations. At least monthly, hold a short written test covering the vehicle abuses and drivers' faults most prevalent as judged from observation as described in preceding paragraphs. Discuss the test with the drivers, explaining the correct answer, and post each man's grade.

b. REEXAMINATION. Every 6 months reexamine each driver in the organization. As a result of the examination the weak points of each driver will be discovered. Give each man additional training as needed. After retraining the drivers, give the examination again to everyone who failed it, and if he still fails to pass, revoke his operator's permit. This reexamination and retraining procedure is essential in maintaining driver efficiency. It is the only method which will discover and correct the bad habits which even the best of drivers form. The same care and thoroughness is used in carrying out this reexamination and retraining as in training and examining new drivers.

78. Drivers' Qualification Badges

a. The award of a qualification badge is authorized for drivers and assistant drivers who have successfully passed prescribed aptitude and qualification tests; who have performed duty for a minimum of three months as a driver or assistant driver of an Army vehicle without traffic violations, and with an accident free record and a rating of excellent.

b. It is definitely a function of driver supervision to see that drivers and assistant drivers who are entitled to this award receive it, that they wear the badge, and to see that it has such meaning that they are proud to wear it. An officer in each unit should be made responsible for continuous supervision of this matter. When drivers and assistant drivers have served 3 months, this officer should give a check examination to insure that they are still qualified for the award and then arrange for the award to be made at an appropriate ceremony.

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79. Summary

Supervision is essential to maintaining driver efficiency. A good supervisor must be able to see, recognize and correct driving faults. Supervision is the duty of every officer and noncommissioned officer in the Army. If drivers are properly selected, trained, examined and supervised, their vehicles will give long service and require little corrective maintenance.

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APPENDIX I

A TANK DRIVER TRAINING COURSE

This discussion covers the organization of a training course for tank drivers. It can be easily adapted to courses for other than tank drivers. This course is based upon a period of 6 weeks.

1. Organization

a. INSTRUCTORS. One officer in charge, one additional officer for each 10 students, and one qualified enlisted instructor for each two students.

b. FACILITIES.

Classroom.
Shops.
Vehicles.
Driving range.
Set of flag signals for each two students.
Flashlight for each two students.
Trip tickets.
Enlarged trip ticket properly filled out.
Enlarged duty roster.
Copies of duty roster.
1 pertinent Technical Manual and 1 lubrication order for each student.
1 operator's permit form for each student.
1 enlarged accident report form.
1 driver's accident report and identification card for each student.
1 enlarged traffic circulation map and key to symbols.
Visual aids for mechanical training.

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2. Program of Instruction

Subject	*Hours*
NONMECHANICAL PRELIMINARY TRAINING	
Fundamentals of driving	1
Methods by which the driver learns	1
Rules of the road and safety precautions	1
Signals, hand, flag, and light	8
Drivers trip ticket and operators permit	1
Drivers references, Technical Manuals, Lubrication Orders	1
Accident report	1
Map reading and traffic circulation maps	4
Total	18
MECHANICAL PRELIMINARY TRAINING	
Tank characteristics and installations	4
Tracks and suspensions	4
Power train	8
Engine	8
Electrical system and trouble shooting	8
Gyrostabilizer, power traversing mechanism, fire fighting equipment, radio installations	4
Instruments and controls	3
Starting and stopping engine	3
First echelon maintenance and crew drill	12
Army maintenance system	1
Test	1
Total	56
DRIVING EXERCISES	
Flat terrain driving and test	24
Intermediate terrain driving and test	24
Combat type driving and test	48
Total	96
Grand total for course	170

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APPENDIX II

DRIVER INSTRUCTION FOR AMPHIBIOUS OPERATIONS

1. Preliminary

a. Special training is required for drivers participating in amphibious operations. Drivers of half-tracks and tanks are re-examined and those who do not meet the requirements are removed as drivers. Emphasis is on backing and parking with strict adherence to both night and day signals of guides. The driver's training should be so thorough on amphibious operations that he does them automatically.

b. WATERPROOFING. The training of drivers in all stages of waterproofing their vehicles and the special maintenance required before waterproofing is of the greatest importance. One faulty seal on a vehicle component or tank hull might easily stall the vehicle and immobilize the succeeding vehicles with disastrous results. (See TM 9–2853.)

2. Discipline

The naval commanding officer of the craft, irrespective of his rank, is in absolute command of all personnel, including military personnel, in his craft. This command is exercised through channels, but in an emergency may be exercised directly. Drivers use only the space allotted them and no smoking or lights are permitted without the permission of the commanding officer of the craft. The naval commander is responsible for the safety of the craft and personnel and full cooperation is given him.

3. Loading

a. PARKING AREA. A parking area is set aside where vehicles are arranged in the right order for loading onto the craft. Vehicles are loaded in reverse order to that in which they will be unloaded. A careful check is made of gears used. Front wheel drives are engaged on half-tracks.

b. GEAR. In heavy sand or mud the lowest gear is used. When beach is alternately hard and soft, a gear which will permit the vehicle's momentum to carry through the soft spots is permitted. On

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hard ground when the distance to the ship is great enough so that the waterproofed vehicle is in danger of overheating in low gear, higher gears are permitted.

c. Alignment. Before driving up the ramp of a vessel, a guide is posted to see that each driver aligns his vehicle correctly. The driver then centers his steering wheel, if any, so that the vehicle may be backed into the hold with a minimum of steering. The practice of leaning out of compartment openings to watch the movement of their own vehicles is prohibited.

4. Aboard Ship

a. Control. Once aboard the vessel, the navy is in complete control. Stowage is directed by naval personnel; however, drivers are responsible for lashing and wedging their vehicles. As soon as one vehicle is stowed, the next one in order of priority in the stowage plan must be ready to load.

b. Lashing. Vehicles are left in gear with brakes set. Wooden blocks and wedges are placed forward and aft of the wheels or tracks. Wire, chains, or lashings are attached to eye bolts in the deck plates or to stringers. Lashings are attached, when possible, to the tow hooks of the vehicle. Care is taken not to damage assemblies such as the brake system, steering linkage, and transmission of the vehicle.

c. Signals. Since lighting in the hold of the vessel may be deficient or absent, the drivers are required to depend entirely on the signals of guides.

5. Unloading

Unloading is undertaken when and as directed by the commander of the ship. For unloading operations the driver is practiced in driving down steep slopes into water. It is while driving the vehicle down the ramp into the sea that the greatest experience, skill, and confidence are required. At this time, most cases of drowning of engines occur. The majority of these are due to inexperience rather than ineffective waterproofing. The following is applicable to all types of landings:

a. Ample warning is given by the commander of the ship of the time of landing, and permission is granted to start engines. Ordinarily this is approximately 45 to 60 minutes before the hour of beaching. Engines are run for about fifteen minutes at fast idling speed, then stopped and started again about five minutes before beaching. No further warming up is permitted unless extreme cold is encountered. On a still night, a tank engine in the hold of a vessel can be heard 4½ miles away. If on LCTs, guns on the vehicles are pointed so they can fire to the front and to both sides.

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b. Chokes are not used once waterproofing is completed. Starting can be assisted by placing the hand over the end of the inlet extension.

c. With the permission of the commanding officer of the craft, chocks and lashings are removed from the vehicles.

d. A final check is made of the waterproofing.

e. Persons are kept under cover or remain in their vehicle.

6. Procedure on Beaching

a. Leaving Ship. Front-wheel drive is used without exception. All vehicles are driven off the craft in the lowest forward gear with the hand throttle halfway out. Vehicles are driven steadily down the ramp until the front wheels or the front of the tracks touch the ground; then the accelerator is pushed all the way down. Full power is applied to move the vehicle against the pressure of water. Drivers have a tendency to let up on the accelerator when they hit the water. Delay in opening the throttle until the rear of the vehicle touches the ground may cause it to dig itself in. The driver keeps his foot on the accelerator pedal firmly, taking care to see that it does not slip off or that it does not relax momentarily. Except in full-track vehicles, the clutch is not used while the vehicle is moving down the ramp or in the water. The use of the choke at that point will cause the immediate failing of the engine. Tow cables are shackled to the vehicle or all hooks are moused.

b. Emergency Action. Under no circumstances is the vehicle halted in such a position that it blocks the way for the next vehicle leaving the craft. In an emergency, drivers must be alert to do precisely what they are ordered by responsible naval personnel. If it is ordered that a vehicle be jettisoned, the driver will take such action to jettison the vehicle as may be required. Under no circumstances is any single vehicle allowed to delay or block vehicles still on the vessel.

7. On Reaching the Beach

a. Vehicles are driven straight across the beach, as directed, to exits. Drivers do not change gear on a beach until a roadway is reached. Exceptions to this rule may be made on long, firm beaches where such permission is given specifically or where higher vehicle speed is required to cross strips of soft sand or mud. Except in cases where vehicles land prior to daylight or prior to the time the beaches are swept, vehicles are never stopped at the water's edge. Tanks which land before daylight should take hull down positions on the beach and give fire support.

b. It will be found that brakes are ineffective until the water dries off the brake shoes and drums. Brakes are applied for short distances while moving; otherwise, when the vehicle is parked, the shoes may stick to the drum, due to the action of salt water.

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c. Immediately upon landing, vehicles move to a designated de-waterproofing area where shrouds are jettisoned (tanks). All engine openings are unplugged or unsealed, including the distributor vent on half-tracks.

d. As soon as practical after landing remove the remainder of the waterproofing, wash the vehicle with fresh water, lubricate and change oil and gear lub, if water is found in them. On half-tracks remove the starter and generator and flush and oil.

e. The beach master and beach commander have control of unloading and getting the vehicles off the beach to the beach transit area and thence to the assembly areas.

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