

AD-A176 910

TATION PAGE

Form Approved
GMB No 0704-0188
Exp Date Jun 30, 1986

1a REPORT SECURITY CLASSIFICATION UNCLASSIFIED		1b RESTRICTIVE MARKINGS	
2a SECURITY CLASSIFICATION AUTHORITY		3 DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution unlimited.	
2b DECLASSIFICATION/DOWNGRADING SCHEDULE			
4 PERFORMING ORGANIZATION REPORT NUMBER(S) TOP 0-2-800 SC5 2		5 MONITORING ORGANIZATION REPORT NUMBER(S)	
6a NAME OF PERFORMING ORGANIZATION U.S. ARMY COMBAT SYSTEMS TEST ACTIVITY	6b OFFICE SYMBOL (If applicable) (STECS-AD)	7a NAME OF MONITORING ORGANIZATION	
6c ADDRESS (City, State, and ZIP Code) ABERDEEN PROVING GROUND, MARYLAND 21005-5059		7b ADDRESS (City, State, and ZIP Code)	
8a NAME OF FUNDING/SPONSORING ORGANIZATION U.S. ARMY TEST & EVALUATION COMMAND	8b OFFICE SYMBOL (If applicable) (AMSTE-TC-M)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER	
8c ADDRESS (City, State, and ZIP Code) ABERDEEN PROVING GROUND, MARYLAND 21005-5055		10 SOURCE OF FUNDING NUMBERS	
		PROGRAM ELEMENT NO AMC-R	PROJECT NO 310-6
11 TITLE (Include Security Classification) TEST OPERATIONS PROCEDURE "INSPECTION AND PRELIMINARY OPERATION OF VEHICLES"			
12 PERSONAL AUTHOR(S)			
13a TYPE OF REPORT Final	13b TIME COVERED FROM _____ TO _____	14 DATE OF REPORT (Year, Month, Day) 4 February 1987	15 PAGE COUNT
16 SUPPLEMENTARY NOTATION			
17 COSATI CODES		18 SUBJECT TERMS (Continue on reverse if necessary and identify by block number)	
FIELD	GROUP	SUB-GROUP	Inspection; Vehicle Inspection; Initial Inspection; Vehicle Operation; Test methods; Preliminary Operation
19 ABSTRACT (Continue on reverse if necessary and identify by block number) Provides procedures for inspecting vehicles before, during, and after testing and for preliminary operation of new vehicles before testing.			
20 DISTRIBUTION/AVAILABILITY OF ABSTRACT <input type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS RPT <input type="checkbox"/> DTIC USERS		21 ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED	
2a NAME OF RESPONSIBLE INDIVIDUAL		22b TELEPHONE (include Area Code)	22c OFFICE SYMBOL

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U.S. ARMY TEST AND EVALUATION COMMAND
TEST OPERATIONS PROCEDURE

AMSTE-RP-702-101

*Test Operations Procedure (TOP) 2-2-505
AD No.

4 February 1987

INSPECTION AND PRELIMINARY OPERATION OF VEHICLES

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1. SCOPE. This TOP provides procedures for inspecting vehicles before, during, and after testing and for preliminary operation of new vehicles before testing.

2. FACILITIES AND INSTRUMENTATION.

2.1 Facilities.

<u>ITEM</u>	<u>REQUIREMENTS</u>
Inspection facility	Shop area for inspecting and servicing test item and for conducting an inventory of the system support package (SSP)
Break-in course	A smooth, paved roadway

*This TOP supersedes TOP 2-2-505 dated 14 July 1977.

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Justification _____

By _____

Distribution/ _____

Availability Codes _____



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2.2 Instrumentation.

<u>DEVICE FOR MEASURING</u>	<u>PERMISSIBLE ERROR OF MEASUREMENT*</u>
Voltage	$\pm 0.5\%$ full scale (FS) range
Electric current	Amps, $\pm 0.1\%$ FS
Vehicle speed (e.g., vehicle performance recorder [VPR] described in TOP 2-2-506 ^{1**})	At 15 km/hr, ± 3 km/hr At 50 km/hr, ± 5 km/hr At 100 km/hr, ± 5 km/hr ± 10 revolutions per 1000 revolutions
Mileage	-1% to $+3.75\%$ for each km of travel at 70 km/hr
Time	± 10 minutes in 24 hours
Rpm	$\pm 2\%$ FS
Ignition or injector timing	to within $\pm 1^\circ$

3. REQUIRED TEST CONDITIONS.

- a. Ensure that facilities and instrumentation conform to minimum requirements.
- b. If possible, mount a VPR on each vehicle to record vehicle speed, mileage, operating time, and engine rpm. Otherwise, install an appropriate recording device, e.g., recording tachograph, Servis-Recorder, hour meter, or hub odometer.
- c. Orient test personnel to the objectives of the inspection, method of inspection, safety precautions to be taken, data to be collected, and means of recording the data.
- d. For developmental vehicles, ensure that a safety assessment report (SAR) has been received from the developer (see AR 385-16³).
- e. Make sure vehicles carry only minimum loads during break-in operation.
- f. Unless otherwise specified, use referee grade fuels (see TOP 2-2-701⁴).
- g. Perform a safety inspection in accordance with TOP 2-2-508⁵ before operating a vehicle.
- h. Teardown inspections of major components are not performed before testing of development and production vehicles unless specifically directed by the sponsoring agency. If teardown inspections are requested and authorized, representatives from the test sponsoring agency and the vehicle manufacturer should be present during the teardown inspection.

*The permissible error of measurement (instrumentation) is the two-sigma value for normal distribution; thus, the stated errors should not be exceeded in more than 1 measurement of 20.

**Footnote numbers correspond to reference numbers in Appendix A.

4. TEST PROCEDURES.

4.1 Initial Inspection.

4.1.1 Receiving.

4.1.1.1 Method.

a. Inspect the test item and SSP in the shipping configuration for the following:

(1) Any visible damage to the test item, boxes, crates, or shipping containers. Photograph any damage.

(2) Improperly installed, damaged, or otherwise unsuitable tie-down or blocking material.

(3) Discrepancies between test item or package marking and the shipping document.

b. Unload, uncrate, and unpack the test item and SSP; visually inspect for damage and adequacy of packaging materials.

c. Weigh and measure the test item with all accessories, full of fuel and other fluids, but without cargo or crew.

d. Inventory the test item and SSP against the packing list. Stow all OEM on the test item to ensure that the equipment is supplied and can be adapted to the test item in the utility or stowed condition. Verify that the SSP contains the required publications, tools, test equipment, accessories, and repair parts.

e. Take photographs as necessary to illustrate all features of the test item and any discrepancies noted.

4.1.1.2 Data Required. Record the following:

a. Date test item arrived

b. Mode of transportation (including carrier and bill of lading number as required)

c. Test item nomenclature, model, and serial numbers; record the same data for major components when applicable

d. Mileage, hours, or other appropriate measure of test item use

e. Adequacy of blocking or tie-down materials and packaging

f. Shortages or damage of test item or SSP; include photos of any damage.

4.1.2 Preoperational. An inspection must be performed before a test begins to determine the operational status of the test item and to establish a baseline upon which performance or malfunctions during the test can be measured.

4.1.2.1 Method. Inspect the test item using the operator/organizational technical manuals and/or developer-provided instructions in the SSP. Use DA Form 2404, Equipment Inspection and Maintenance Worksheet, to record inspection results.⁶

When technical manuals are not available, conduct the inspection using the best source data available, including the experience of the test director. The procedures and checks listed below are furnished as a guide for determining the extent of inspection and are not intended to be all-inclusive.

a. Using the applicable lubrication order, check for proper levels and grades of lubricant, oils, hydraulic fluids, coolants, etc., and record readings. Lubricate the test item in accordance with the applicable lubrication order. If information regarding the lubricants is not provided by the manufacturer, samples should be chemically analyzed for suitability. For those vehicles in the Army oil analysis program, samples must be taken initially, periodically, and during changes. When it is necessary to change lubricants, refill with the correct seasonal grade, and record drain and temperature times and capacities (if not previously recorded).

b. Check batteries, if wet-charged, for fully charged condition and proper electrolyte level. If dry-charge batteries are provided, activate and charge as required.

c. Check electrical system for proper connections and voltage output.

d. Adjust components such as brakes, governor-control linkage (throttle), headlights, and hydraulic systems, as necessary.

e. Collect initial tire data for Commodity Command Data Bank and local automatic data processing, when applicable, in accordance with TOP 2-2-704.⁷

f. Inspect fire extinguishers as follows (also see MTP 10-2-051⁸):

(1) Portable Fire Extinguishers - Weigh each portable fire extinguisher, check seal, and reinstall in vehicle without discharge.

(2) Fixed Fire Extinguisher System - Remove all cylinders and weigh individually. Check internal and external discharge mechanisms to ensure that they are functioning properly before reinstalling cylinders. Reinstall cylinders, operate discharge mechanisms, and record pull in newtons (pounds) to operate fixed extinguisher pull control. Check for time delay between first and second shots as well as engine shutdown from idle for those vehicles with this type of fixed fire extinguisher system. Remove discharged cylinders, recharge and reinstall. Inspect gauges for proper charge indication. Use Standard Test Equipment (STE) to ensure proper operation of sensors and system on vehicles equipped in this manner.

g. Measure the vehicle, vehicle parts, components, or systems (initial wash, physical dimensions, wheel alignment, suspension clearances, axle housing, etc.) for which unusual wear can be expected.

h. Check accessibility of maintainable items (batteries, air cleaners, lubrication fittings, and other components).

i. Visually inspect the test item for possible safety hazards to operators, passengers and cargo, or bystanders.

4.1.2.2 Data Required. Obtain the following:

a. Results of inspection as recorded on DA Form 2404 or other prepared form as supplied or instructed by test director

b. Tire data, when applicable, in accordance with TOP 2-2-704.

c. Any repair, adjustment, or service made except that prescribed to prepare the vehicle for operation, and time required.

d. Measurements and nomenclature of parts, components, or systems measured for wear or deformation.

4.2 Periodic Inspection.

4.2.1 Method. Throughout testing, conduct periodic inspections as prescribed by the applicable technical manuals or more often if test conditions warrant or information of a special nature is required. For instance, inspection of the armament is required after each firing program, or engine inspections may be necessary after full-load dynamometer tests, even if there is no need for a full vehicle inspection. Vehicles having inherent floatability should be carefully inspected to determine the permanence of this feature. In all inspections, include any component or function that could affect the safety of the vehicle. Collect samples of lubricants from engine and gear boxes as appropriate.

4.2.2 Data Required. Record data as in paragraph 4.1.2.2.

4.3 Final Inspection.

4.3.1 Method.

a. At the completion of testing, visually inspect the test item for damage not detected during the course of testing.

b. Repeat the measurement of vehicle, vehicle parts, components, or systems (para 4.1.2.1g) to determine whether any unusual wear or deformation has occurred. Take lubricant samples as appropriate.

c. When applicable, conduct a limited teardown inspection as required to satisfy criteria requirements (e.g., seals shall prevent the leakage of lubricants and the entrance of foreign matter) and in those areas where test operations indicate a need for a more detailed investigation.

d. Take final tire wear measurements, if applicable, in accordance with TOP 2-2-704.

4.3.2 Data Required. Collect the following data as applicable:

a. A record of damages discovered by inspection after testing

b. A list of components that required teardown and a record of findings

- c. Final tire tread depth readings
- d. Final readings of mileage, hours, or other indicators of test item use
- e. Measurements and nomenclature of parts, components, or systems measured for wear or deformation
- f. Oil and lubricant analysis, as appropriate

4.4 Preliminary Operation. All new automotive equipment is subjected to a period of break-in operation before testing is started to ensure the proper seating of mating parts and, by disposing of initial wear, to permit more permanent adjustments to be made before starting other operations. This break-in period also provides an opportunity for driver training and familiarization with the test item. Before the break-in operation, the vehicle is given an initial inspection as described in paragraph 4.1.

4.4.1 Method.

a. Operate the vehicle over a smooth, paved road for the appropriate break-in mileage shown in Table 1 unless otherwise specified by the requirements document, manufacturer, or technical manual. Use speeds recommended by the manufacturer when they are more restrictive than those shown in the table.

b. Perform the maintenance checks prescribed by the operator's manual or other appropriate document for the break-in period with emphasis on coolant and oil leaks and overheating of unmonitored components (those without warning lights, temperature gauges, etc.).

c. Check bolts and nuts securing wheels, idlers, track blocks, etc., for loosening during break-in operation.

d. Observe and record potential safety hazards inherent in the operation of the test item.

4.4.2 Data Required. Record the following:

- a. Break-in distance driven and speed attained
- b. Type of road or terrain
- c. Any damage or malfunction of equipment
- d. Maintenance required during and after break-in operation by type of effort and man-hours required
- e. Driving effort (normal, excessive, or otherwise)
- f. Safety of operation

5. DATA PRESENTATION.

- a. Tabulate and report all discrepancies by test incident report (TIR).
- b. Discuss the completeness of the SSP, including the impact on testing of any waivers received for items not supplied.
- c. Compare preoperational inspection data with final inspection data to determine wear, deformation, or damage of the test item as a result of testing.

TABLE 1 - RECOMMENDED BREAK-IN MILEAGE

Vehicle Type	Kilometers	Operation
Wheeled Vehicles	500	320 km at speeds not exceeding 50% of the maximum or governed speed. ^a
		480 km at varying speeds not exceeding 8 km/hr less than the maximum or governed speed. ^a
Tracked Vehicles	^b 80	25 km at 30% of maximum speed. ^a
		25 km at 50% of maximum speed. ^a
		30 km at 75% of maximum speed. ^a
Commercial Tractors	4 hours	Operate in all gear positions starting in the lowest gear (15 minutes minimum in each).

^aFollowed by 15 m in reverse.

^bAfter break-in is completed, check track adjustment.

Recommended changes of this publication should be forwarded to Commander, U.S. Army Test and Evaluation Command, ATTN: AMSTE-TC-M, Aberdeen Proving Ground, MD 21005-5055. Technical information can be obtained from the preparing activity: Commander, U.S. Army Combat Systems Test Activity ATTN: STECS-AD, Aberdeen Proving Ground, MD 21005-5059. Additional copies are available from the Defense Technical Information Center, Cameron Station, Alexandria, VA 22304-6145. This document is identified by the accession number (AD No.) printed on the first page.

APPENDIX A
REQUIRED REFERENCES

1. TOP 2-2-506, Endurance Testing of Tracked and Wheeled Vehicles, 26 June 1981.
2. ITOP 2-2-506, Endurance Testing of Tracked Vehicles, 15 May 1984.
3. AR 385-16, System Safety Engineering and Management, 1 December 1980; DARCOM Suppl 1, 22 January 1982; TECOM Suppl 1, 11 June 1982; and APG Suppl 1, 5 January 1983.
4. TOP 2-2-701, Fuels and Lubricants, 2 July 1976.
5. TOP 2-2-508, Automotive Safety and Health Hazard Evaluation, 24 November 1982.
6. TM 38-750, The Army Maintenance Management System (TAMMS).
7. TOP 2-2-704, Tires, 23 January 1976.
8. MTP 10-2-051, Fire Extinguishers, 12 July 1969.