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

*Test Operations Procedure (TOP) 02-2-505A
DTIC AD No.

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INSPECTION AND PRELIMINARY OPERATION OF VEHICLES

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*This TOP supersedes TOP 02-2-505 Inspection and Preliminary Operation of Vehicles, dated 4 February 1987.

Approved for public release; distribution unlimited.

1. SCOPE.

This Test Operations Procedure (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 Calibration.

a. All measuring tools and instrumentation will be calibrated against a higher order standard at periodic intervals not to exceed twelve months. Records showing the calibration traceability to the National Institute of Standards and Technology (NIST) will be maintained for all measuring and test equipment.

b. All measuring and test equipment will be labeled with the following information:

(1) Date of calibration.

(2) Date of next scheduled calibration.

(3) Name of the organization and technician who calibrated the equipment.

c. A written calibration report will be provided that includes as a minimum the following information for all measurement and test equipment:

(1) Type of equipment, manufacturer, model number, etc.

(2) Measurement range.

(3) Accuracy.

(4) Calibration interval.

(5) Type of standard used to calibrate the equipment (calibration traceability of the standard must be evident).

2.2 Facilities.

Item

Inspection facility

Requirement

Shop area for inspecting and servicing test items, installing instrumentation, and conducting an inventory of the System Support Package (SSP).

| <u>Item</u> | <u>Requirement</u> |
|-----------------|---|
| Break-in course | A closed course suitable for operating new and experimental vehicles. Specific terrain will be vehicle dependent. |

2.3 Instrumentation.

| <u>Devices for Measuring</u> | <u>Maximum Error of Measurement^a</u> |
|------------------------------|---|
| Weight | $\pm 0.5\%$ accuracy of reading |
| Mileage | $\pm 2\%$ of the true distance or ± 20 meters (m), whichever is greater |
| Vehicle Speed | ± 0.2 kilometers per hour (km/hr) (± 0.1 miles per hour (mph)) |
| Time | ± 0.1 seconds |
| Engine Speed | ± 10 revolutions per minute (rpm) |
| Acceleration | $\pm 5\%$ of reading or ± 0.1 g, whichever is greater |
| Angular acceleration rate | ± 0.1 degrees per second (deg/sec) |
| Voltage | $\pm 0.5\%$ of full scale (FS) range |
| Electric current | Amps, $\pm 0.1\%$ FS |
| Ignition or injector timing | ± 1 degrees |

^a Values may be assumed to represent ± 2 standard deviations. Thus, the stated tolerances should not be exceeded in more than one (1) measurement out of 20.

2.3.1 Inertial Measurement System.

Vehicle reactions are measured using a 6-degree of freedom inertial measurement system to record pitch (θ), roll (ϕ), and yaw (Ψ) rates, and longitudinal (x), lateral (y), and vertical (z) acceleration of the vehicle chassis. The transducer should be mounted as close as practical to the center of gravity of the test vehicle.

2.3.2 Controller Area Network (CAN) Bus.

If the test vehicle is equipped with a CAN data bus, applicable data should be monitored and recorded, as described in TOP 01-2-506^{1**}. The data bus can provide key information for endurance/mobility tests, including gear ranges selected and attained, torque converter status, throttle position, relative power and torque values, traction control status, etc. The validity of the data bus information must be verified or the source of data documented.

2.4 Additional Equipment.

A digital camera to photograph overall views of the vehicles and all instrumentation locations.

3. REQUIRED TEST CONDITIONS.

a. Ensure that facilities and instrumentation conform to minimum requirements.

b. Prior to instrumentation installation, the proper operation of the vehicle should be verified to ensure that the instrumentation is not responsible for causing system problems. Any deficiencies identified during the operational check should be documented, and if possible, corrected before continuing. If possible, install calibrated instrumentation on each vehicle to record vehicle speed, mileage, operating time, engine speed (rpm), acceleration, angular acceleration, and position (time and location using Global Positioning System (GPS)). An Advanced Distributed Modular Acquisition System (ADMAS), or equivalent system, is recommended for data acquisition and recording. Analog data channels should be sampled at a rate greater than twice the low-pass filter frequency to prevent aliasing of the data. CAN bus data should also be recorded. Calibrated instrumentation should be used to verify the CAN bus output.

c. Review the objectives of the inspection, method of inspection, safety precautions to be taken, data to be acquired, and the process of recording the data with test personnel.

d. For developmental vehicles, review the safety assessment report (SAR) provided by the vehicle developer to determine safety risks associated with operation and maintenance of the system, and to accept or develop new mitigations prior to operating or maintaining the system (see Army Regulation (AR) 385-10²).

e. Ensure that the vehicles carry only the minimum loads during break-in operations.

f. Use the fuel type specified by the vehicle manufacturer and/or appropriate Technical Manual (TM).

g. Perform a safety inspection before operating the vehicle.

** Superscript numbers correspond to Appendix C, References.

h. Teardown inspections of major components are not performed before testing of development and production vehicles unless specifically directed by the test sponsoring agency. Cases where a deficiency is found may warrant disassembly for investigation. If teardown inspections are requested and authorized, representatives from the test sponsoring agency and the vehicle manufacturer should be present during the teardown inspection.

4. TEST PROCEDURES.

4.1 Initial Inspection.

4.1.1 Receiving.

4.1.1.1 Method.

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

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

(2) Improperly installed, damaged, or otherwise unsuitable restraint devices.

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

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 tank(s) of fuel and other fluids, but without cargo and crew. Incrementally weigh the vehicle if it will be tested in multiple configurations, for example: with the addition of various armor kits.

d. Inventory the test item and SSP against the packing list. Stow all Original Equipment Manufacturer (OEM) parts 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. Photograph to show 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, where applicable.
- d. Mileage, hours and/or other appropriate measure of test item use.
- e. Adequacy of restraint system and packaging.
- f. Equipment shortages.
- g. Damage of the test item and/or SSP; photograph any damage.

4.1.2 Preoperational.

An inspection must be performed before testing 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.

Review notes from the Hazard Analysis Working Group (HAWG) and follow the procedures documented in the appropriate Job Hazard Analysis (JHA) and Standard Operating Procedures (SOP) for the inspection process. Inspect the test item using the appropriate TM, Operator's Manuals (OM), and/or instructions provided by the materiel developer in the SSP. Perform Preventive Maintenance Checks and Services (PMCS) and perform any needed repairs according to the proper TM or OM. Record and document inspection results and maintenance in Test Incident Reports (TIRs). Use Department of the Army (DA) Form 2404, Equipment Inspection and Maintenance Worksheet, if required. When TMs are not available, conduct the inspection using the best source data available, including the experience of the test officer, vehicle mechanic, and guidance from the manufacturer's engineering and service representatives. 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 sample checklist guide for vehicle inspections is included in Appendix A.

- a. Using the applicable lubrication order, check for proper levels and grades of lubricants, 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 vehicles registered in the Army oil analysis program, samples must be taken initially, periodically, and during oil changes. When necessary to change lubricants, refill with the correct seasonal grade. Record the fluid temperature, the drain time and the amount of lubricant recovered.
- 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. For High Voltage electrical systems, vehicle specific training must be successfully completed prior to accessing the electrical system.

c. Check electrical system for proper connections and voltage output. Record the measured voltage output.

d. Visually inspect brake (service and parking brakes) systems and ensure they are properly assembled and fully functional. Measure the brake pads and rotors to ensure that the maintenance manual requirements are met. Perform brake drum and brake shoe air gap measure according to the vehicle maintenance manual. Correct any brake issues before initiating test operations of the vehicle.

e. Adjust components such as throttle, headlights, and hydraulic systems, as necessary.

f. A redundant emergency stop (E-stop) with an independent power supply will be installed on unmanned ground vehicles (UGV). This E-stop device must be separate from the onboard computers and is provided as a backup to the integrated emergency shutdown device. Verify the proper functioning of on-board and remote E-stop switches on UGVs (see TOP 02-2-540³). The system must demonstrate the ability to safely stop when an uncontrolled event or unsafe condition occurs.

g. Inspect tires for wear and correct tire pressure. Tires with excessive wear should be replaced with acceptable tires of the proper size. Examine tires for possible wheel alignment issues and realign, if necessary. For vehicles equipped with a Central Tire Inflation System (CTIS), verify the operation of the system by checking all tire pressures at each CTIS setting. Collect initial tire data for Commodity Command Data Bank, when requested, in accordance with TOP 02-2-704A⁴.

h. Adjust vehicle tracks to the proper tension and inspect the track for wear of the grousers and pads. Replace vehicle track/pads if worn beyond acceptable levels. Inspect roadwheels for wear and replace if necessary.

i. Height Management Systems (HMS) should be verified by operating the system and checking for leaks.

j. Inspect fire extinguishers as follows:

(1) Portable Fire Extinguishers: Weigh each portable fire extinguisher, check seal, verify expiration date, and reinstall in the vehicle without discharge. If fire extinguishing devices are not provided with the vehicle, one must be verified and installed prior to test initiation. At least one fire extinguisher should be available in each crew compartment.

(2) Fixed Fire Extinguisher System: Inspect fire extinguisher pressure gages for proper charge indication and recharge if necessary. Automatic Fire Extinguisher Systems (AFES) should be capped during maintenance in case of inadvertent discharge. Ensure that AFES nozzles are uncapped, unpinned, and fully operational prior to conducting any operations. TM procedures for this should be followed.

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

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

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

n. Document and update (if necessary), the software history and status of downloads for major vehicle control units.

(1) Verify that proper engine/transmission control module software version is installed and the settings are correct. The engine specific Full Load Setting (FLS) and Full Torque Setting (FTS) that are programmed into the Engine Control Module (ECM) should match the engine specific values that are located on the engine data plate. If the data plate information is not available, the FLS and FTS settings may be identified for Caterpillar engines in the Caterpillar Service Information System (SIS) or by contacting the Caterpillar Military Sales department. If the engine has been rebuilt, it may be necessary to have a Caterpillar technician with proprietary Caterpillar software determine what the new values for FLS and FTS will be for that engine. If new FLS/FTS values are determined, a new engine data plate should be generated and installed for future applications. Engines built by other manufacturers should be verified in a similar fashion.

(2) The fuel injector trim files that are programmed into the ECM should match the actual fuel injectors in their correct cylinder locations. The engine valve mechanism covers require removal so that each fuel injector serial number can be read and recorded. Mismatches of these settings and fuel injector trim files can reduce or increase horsepower and torque output depending on the specific engine.

(3) Default programmed ECMs that are referred to in Interactive Electronic Technical Manuals (IETM) may be used. If troubleshooting techniques in the IETM direct the maintainer to replace the ECM, an ECM Replacement File that can be loaded onto a blank ECM may also be used. Identifying information, lifetime totals, engine serial number, FLS/FTS, and fuel injector trim files can all be loaded onto the blank ECM with the proper software provided by the engine vendor. The engine serial number and FLS/FTS settings will be locked after they are set one time. Blank ECMs are more readily available from the Defense Logistics Agency (DLA) or a local engine dealer representative for significantly less cost and generally have shorter lead times than preprogrammed ECMs. Caterpillar Electronic Technician (CAT-ET) Military Vehicle Software is free to the Department of Defense (DOD) and works on all Caterpillar engines with military designated serial numbers. It is good practice to record ECM settings with a Product Status Report (PSRPT) before any changes are made if the suspect ECM still has the ability to communicate with the CAT-ET software. ECMs for engines built by other manufacturers should be replaced using the appropriate method specified by the engine manufacturer.

o. Vehicles equipped with turrets that will be rotating during test course operations should be equipped with a rotating/flashing amber light, that when activated is visible to other vehicle operators in the vicinity. Medium and large UGVs should be equipped with a strobe light which indicates that the vehicle is being operated by remote control (at Aberdeen Test Center (ATC), a blue light will be used; at other test centers, a standout color that is not already allocated for another use will be chosen). This light will activate whenever an operator logs into the vehicle or whenever the vehicle is functioning robotically. The UGV should also be fitted with an audible alarm which activates whenever the UGV is beginning to move.

4.1.2.2 Data Required.

Obtain the following:

a. Results of inspection as recorded on TIRs, DA Form 2404, or other prepared forms as supplied or instructed by the test officer. A sample checklist guide for vehicle inspections is included in Appendix A.

b. Diagnostic reports, if applicable, downloaded from the ECM and TCM (Transmission Control Module) via the vehicle data bus. These reports may contain data from various vehicle systems including, but not limited to: engine, transmission, Anti-lock Brake System (ABS), Electronic Stability Control (ESC), etc. The data bus information should include, but not be limited to, vehicle speed, engine speed, temperatures, throttle position, and brake applications. The reports should also contain the history of the vehicle's software (version, date).

c. Tire data, when requested, in accordance with TOP 02-2-704A.

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

e. 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 TMs, 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 all lubricated powertrain, cooling, and suspension parts, 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. If findings warrant, disassembly of vehicle components should be performed to determine the causes of any excessive wear and/or damage according to the applicable manuals.

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

c. Take final tire wear measurements, when requested, in accordance with TOP 02-2-704A.

d. Measure tension in vehicle tracks and inspect the track for wear of the grousers and pads. Inspect roadwheels for wear.

e. Inspect the test item using the appropriate TMs and/or instructions provided by the materiel developer in the SSP. Perform PMCS according to the proper TM. Record and document inspection results in TIRs. Use DA Form 2404, Equipment Inspection and Maintenance Worksheet, if required. When TMs are not available, conduct the inspection using the best source data available, including the experience of the test officer and vehicle mechanic. 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 sample checklist guide for vehicle inspections is included in Appendix A.

f. Remove instrumentation that was installed prior to or during testing. Any instrumentation that remains on the vehicle, due to future measurement requirements or inaccessibility for removal should be documented on the Department of Defense Directives Division (DD) Form 1149, Requisition and Invoice/Shipping Document for tracking purposes.

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 should be 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. The vehicle undergoes an initial inspection, as described in paragraph 4.1, prior to break-in operations.

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 TM. Use speeds recommended by the manufacturer when they are more restrictive than those shown in the table.

TABLE 1. RECOMMENDED BREAK-IN MILEAGE

| VEHICLE TYPE | DISTANCE km (mi) | OPERATION |
|--------------------------|---|---|
| Wheeled Vehicles | 800 (500) | 320 km (200 mi) at speeds not exceeding 50% of the maximum or governed speed. ^a 480 km (300 mi) at varying speeds not exceeding 8 km/hr less than the maximum or governed speed. ^a |
| Tracked Vehicles | 80 ^b (50) | 25 km (15 mi) at 30% of maximum speed. ^a 25 km (15 mi) at 50% of maximum speed. ^a 30 km (20 mi) 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). |
| Unmanned Ground Vehicles | Distance will vary dependent on UGV size and mission. Refer to test plan, requirements documents or other documentation for determination of break-in distance. | |

^a Followed by 15 m in reverse.

^b After break-in is completed, check track adjustment.

b. Perform the maintenance checks prescribed by the TM, operator's manual, or other appropriate documents for the break-in period with emphasis on coolant and oil leaks and overheating of unmonitored components (those without warning lights, temperature gages, 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 and speed (average and maximum) attained.

b. Type of road surface(s).

c. Any damage or equipment malfunction.

d. Maintenance required during and after the break-in operation by type of effort and man-hours required.

e. Driving effort (normal, excessive, or other).

f. Safety of operation.

5. DATA REQUIRED.

Recommended data to be recorded are listed in Section 4.

6. PRESENTATION OF DATA.

a. Tabulate and report all discrepancies by 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 resulting from testing.

d. Typical checklist data sheets are provided in Appendix A.

APPENDIX A. CHECKLIST GUIDE FOR INITIAL VEHICLE INSPECTION.

TABLE A-1. VEHICLE INSPECTION DATA SHEET.

| | | | | | | |
|---|---|---------------------|--|--|-------------|-----------|
| <u>Vendor/Company</u> | | | <u>Vehicle Name/Identification</u> <u>(i.e. A1, B3)</u> | | | |
| <u>Vehicle Identification / Serial Number</u> | | | <u>Registration Number</u> | | | |
| <u>Date</u> | <u>km/ miles</u> | <u>Engine Hours</u> | <u>Variant</u> | | | |
| <u>Mechanics</u> | | | | <u>Inspection Type</u> <u>(Initial/Final)</u> | | |
| <u>STEP</u> | <u>VEHICLE INSPECTION</u> | | | <u>PASS</u> | <u>FAIL</u> | <u>NA</u> |
| 1 | Conduct the Before, After, During, Weekly, and Monthly levels of PMCS in accordance with manufacturer guidance. Document deficiencies in TIRs and on Department of the Army (DA) Form 2404, Equipment Inspection and Maintenance Worksheet. | | | | | |
| 2 | Inspect the vehicle for the following possible exterior safety hazards: size, working heights, trip hazards, sharp objects, pinch points, hand/footholds, other. Record Hazards. | | | | | |
| 3 | Inspect the vehicle for the following possible interior safety hazards: workspace concerns, sharp objects, hand/footholds, field of view, equipment storage, hearing, lighting, other. Record Hazards. | | | | | |
| 4 | Check front headlight, parking lights and blackout marker operation. Check rear taillight, reverse lights and blackout marker operation. Check turn signal and brake lights. | | | | | |
| 5 | Check side and/or rearview mirrors mounting and hardware. | | | | | |

APPENDIX A. CHECKLIST GUIDE FOR INITIAL VEHICLE INSPECTION.

TABLE A-1. CONTINUED.

| | | | | | | |
|----|---|----|----|--|--|--|
| 6 | Inspect wheel and tire assemblies. Record tread depth. | | | | | |
| | R1 | R2 | R3 | | | |
| | L1 | L2 | L3 | | | |
| 7 | Inspect windshield and windows for clarity, cracks or chips. | | | | | |
| 8 | Check windshield wipers for proper operation. | | | | | |
| 9 | Internal lighting and horn operation. Verify that the lights and horn operate correctly in blackout mode. | | | | | |
| 10 | Inspect AFES system to include controls, discharge include controls, discharge direction (nozzle), location of bottles, pressures, ensure manual functionality (do not discharge). Record issues. | | | | | |
| 11 | Inspect portable fire extinguishers for charge, access, and mounting. Record number, size, and location. | | | | | |
| 12 | Inspect engine compartment for leaks, damaged or loose components. Inspect belts, fans, filters, engine mounting bolts. | | | | | |
| 13 | Inspect vehicle cooling system for leaks and damaged components. | | | | | |
| 14 | Check all fluid levels and adjust as needed. | | | | | |
| 15 | Perform engine start-up and bring engine to operating temperature. | | | | | |
| 16 | While running, inspect vehicle pneumatic system for leaks. | | | | | |
| 17 | Inspect parking brake operation. | | | | | |

APPENDIX A. CHECKLIST GUIDE FOR INITIAL VEHICLE INSPECTION.

TABLE A-1. CONTINUED.

| | | | | | | | |
|----|--|------|----------|---|--|--|--|
| 18 | Check transmission fluid at operating temperature in neutral. | | | | | | |
| 19 | Inspect alternator and record voltage output. | Idle | 1250 rpm | | | | |
| | | | | | | | |
| 20 | Inspect all hatches, doors and windows for proper operation. Inspect all door and hatch locks for proper operation. | | | | | | |
| 21 | Inspect all seats and seat belts for proper operation and loose hardware. Exercise driver's seat and ensure the seat locks into all positions. | | | | | | |
| 22 | Inspect batteries for loose connections and corrosion. Perform load test and record specific gravity. | | | | | | |
| | 1 | 2 | 3 | 4 | | | |
| 23 | Inspect vehicle exhaust system for loose or damaged components. | | | | | | |
| 24 | Inspect fuel tank(s) for cracks, dents and leaks. | | | | | | |
| 25 | Inspect vehicle steering components for damaged parts. Exercise steering wheel and listen for binding in tie rods, ball joints and universal joints. | | | | | | |

APPENDIX A. CHECKLIST GUIDE FOR INITIAL VEHICLE INSPECTION.

TABLE A-1. CONTINUED.

| | | | | |
|----|---|--|--|--|
| 26 | Place vehicle on jack stands and remove all tires and brake drums. Perform visual inspection and ensure brakes are properly assembled and fully functional. Reinstall drums and tires. Remove from jack stands. Perform brake drum and brake shoe air gap measure per vehicle maintenance manual. | | | |
| 27 | For vehicles equipped with disc brakes, remove tires and brake caliper. Measure the brake pads and rotors and ensure they meet the maintenance manual requirement. | | | |
| 28 | Inspect front and rear suspension components for bent or damaged items. | | | |
| 29 | Inspect differentials and transfer case for seal leaks, damaged ABS wires and solenoids. | | | |
| 30 | Inspect drive shafts for damaged universal joints, damaged or missing hardware. | | | |
| 31 | For tracked vehicles: Adjust vehicle tracks to the proper tension and inspect the track for wear of the grouser and pads. Replace vehicle track/pads if worn beyond acceptable levels. Inspect roadwheels for wear and replace if necessary. | | | |
| 32 | Inspect all cover and protective plates for loose or missing hardware. | | | |
| 33 | Check the securement of cargo and stowed components. | | | |
| 34 | Install a rotating/flashing amber light on vehicles with rotating turrets and install a blue (at ATC) or other unique color strobe light on medium and large UGVs to indicate that the vehicle is being operated by remote control. | | | |
| 35 | Install radios for range communication. | | | |
| 36 | Install instrumentation for operation on test courses. The minimal instrumentation package will include a Global Positioning System (GPS) for position and time data, a triaxial accelerometer, a triaxial angular accelerometer and data recording instrumentation. | | | |

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APPENDIX B. ABBREVIATIONS.

| | |
|----------|--|
| ABS | Anti-lock Brake System |
| ADMAS | Advanced Distributed Modular Acquisition System |
| AFES | Automatic Fire Extinguisher System |
| AR | Army Regulation |
| ATC | Aberdeen Test Center |
| | |
| BII | Basic Issue Items |
| | |
| CAN | Controller Area Network |
| CAT-ET | Caterpillar Electronic Technician |
| CTIS | Central Tire Inflation System |
| | |
| DA | Department of the Army |
| DD | Department of Defense Directives Division |
| deg/sec | degrees per second |
| DLA | Defense Logistics Agency |
| DOD | Department of Defense |
| | |
| E-Stop | emergency stop |
| ECM | Engine Control Module |
| | |
| FLS | Full Load Setting |
| FS | full scale |
| FTS | Full Torque Setting |
| | |
| <i>g</i> | gravitational acceleration, 9.8 m/sec ² (32.2 ft/sec ²) |
| GPS | Global Positioning System |
| | |
| HAWG | Hazard Analysis Working Group |
| HMS | Height Management System |
| | |
| IETM | Interactive Electronic Technical Manual |
| | |
| JHA | Job Hazard Analysis |
| | |
| km | kilometers |
| km/hr | kilometers per hour |
| | |
| m | meters |
| mi | miles |
| mph | miles per hour |

APPENDIX B. ABBREVIATIONS.

| | |
|-------|--|
| NIST | National Institute of Standards and Technology |
| OEM | Original Equipment Manufacturer |
| OIML | International Organization of Legal Metrology |
| OM | Operator's Manual |
| PMCS | Preventive Maintenance Checks and Services |
| PSRPT | Product Status Report |
| rpm | revolutions per minute |
| SAR | Safety Assessment Report |
| SIS | Service Information System |
| SOP | Standard Operating Procedure |
| SSP | System Support Package |
| TCM | Transmission Control Module |
| TIR | Test Incident Report |
| TM | Technical Manual |
| TOP | Test Operations Procedure |
| UGV | Unmanned Ground Vehicle |

APPENDIX C. REFERENCES.

1. TOP 01-2-506, Use of Controller Area Network (CAN) Data to Support Performance Testing, 16 July 2015.
2. AR 385-10, The Army Safety Program 27 November 2013.
3. TOP 02-2-540, Testing of Unmanned Ground Vehicle (UGV) Systems, 12 February 2009.
4. TOP 02-2-704A, Tires, 15 December 2015.

For information only (related publications).

- a. North American Standard Level II Inspection Procedure, Commercial Vehicle Safety Alliance, 14 November 2007.
- b. International Organization of Legal Metrology (OIML) R55, International Recommendation, Speedometers, Mechanical Odometers and Chronotachographs for Motor Vehicles-Metrological Regulations, 1981.

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APPENDIX D. APPROVAL AUTHORITY.

CSTE-TM

22 October 2018

MEMORANDUM FOR

Commanders, All Test Centers
Technical Directors, All Test Centers
Directors, U.S. Army Evaluation Center
Commander, U.S. Army Operational Test Command

SUBJECT: Test Operations Procedure (TOP) 02-2-505A Inspection and Preliminary Operation of Vehicles, Approved for Publication

1. TOP 02-2-505A Inspection and Preliminary Operation of Vehicles, has been reviewed by the U.S. Army Test and Evaluation Command (ATEC) Test Centers, the U.S. Army Operational Test Command, and the U.S. Army Evaluation Center. All comments received during the formal coordination period have been adjudicated by the preparing agency. The scope of the document is as follows:

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

2. This document is approved for publication and will be posted to the Reference Library of the ATEC Vision Digital Library System (VDLS). The VDLS website can be accessed at <https://vdls.atc.army.mil/>.

3. Comments, suggestions, or questions on this document should be addressed to U.S. Army Test and Evaluation Command (CSTE-TM), 6617 Aberdeen Boulevard-Third Floor, Aberdeen Proving Ground, MD 21005-5001; or e-mailed to usarmy.apg.atec.mbx.atec-standards@mail.mil.

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STEPHANIE J. HALCISAK
Chief, Policy and Standardization Division

FOR

MICHAEL J. ZWIEBEL
Director, Test Management Directorate (G9)

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TOP 02-2-505A

22 October 2018

Forward comments, recommended changes, or any pertinent data which may be of use in improving this publication to the following address: Policy and Standardization Division (CSTE-TM), U.S. Army Test and Evaluation Command, 6617 Aberdeen Boulevard, Aberdeen Proving Ground, Maryland 21005-5001. Technical information may be obtained from the preparing activity: Automotive Directorate (TEDT-AT-AD), U.S. Army Aberdeen Test Center, 400 Colleran Road, Aberdeen Proving Ground, Maryland 21005-5059. Additional copies can be requested through the following website: <https://www.atec.army.mil/publications/documents.html>, or through the Defense Technical Information Center, 8725 John J. Kingman Rd., STE 0944, Fort Belvoir, VA 22060-6218. This document is identified by the accession number (AD No.) printed on the first page.