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US ARMY TEST AND EVALUATION COMMAND
TEST OPERATIONS PROCEDURE

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*Test Operations Procedure 2-2-802
AD No.

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STORAGE

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1. SCOPE. This TOP provides procedures for evaluating the adequacy of on-equipment materiel (OEM) stowage facilities provided in or on vehicles.

2. FACILITIES AND INSTRUMENTATION. No special facilities or instrumentation are required for this evaluation other than a camera.

3. PREPARATION FOR TEST.

3.1 Planning.

a. Review the TOE or TA of each type unit shown in the requirements document for the vehicle and plan the test to insure that all roles and stowage configurations are evaluated in all applicable mission profiles, for all pertinent climatic zones. Items and related components to be installed in a vehicle will usually vary for each different role in which a specific vehicle is used within one branch of the Army. For example, it is not uncommon for a vehicle to be used as a command post, message center, air control center, and maintenance section within the same branch of the Army. In addition, the same vehicle may be used in several different roles by other branches of the Army.

b. Prepare a stowage evaluation checklist covering the human factors engineering and hardware aspects of the test (para 5.1) using the appendix as a guide and adding specifics for the test vehicle and situation.

*This TOP supersedes MTP 2-2-802, 22 Oct 1965.

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3.2 On-Equipment Materiel (OEM).

- a. Inventory basic issue items received with the vehicle against the technical manual to assure that all items have been received.
- b. Obtain authorized items of issue not furnished with the vehicle and the ammunition required from normal supply channels.
- c. For items which are unavailable, prepare substitute items which simulate the actual item in configuration and weight.
- d. Inspect stowage facilities and items to be stowed for defects or damage. Repair or replace defective or damaged materiel to assure that it is in the best possible condition before test and to establish a baseline from which test results can be evaluated.
- e. Weigh each stowage item and record the individual and total weights. This information is needed to determine what the combat weight of the test vehicle will be.

3.3 Data Requirements.

- a. Vehicle nomenclature and configuration.
- b. List of substitute items with descriptions and photographs.
- c. Any defects or damage discovered during inspection and action taken.

4. TEST CONTROLS. Minimize the use of substitute items since adverse effects of the stowage facility on the items are reflected more realistically by actual items.

5. PERFORMANCE TESTS.

5.1 Compatibility.

5.1.1 Method.

a. Stow each item of OEM in its designated location and record the following:

- (1) Physical incompatibilities, such as tight or loose fit within the space provided, interference with other items, etc.
- (2) Difficulties in operating the devices (latches, clamps, straps) provided for securing the item.
- (3) Potential safety hazards due to weight and configuration of items, or rough edges, sharp points, or other defects on stowage facilities.

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- (4) Damage to item or test vehicle during stowage.
 - (5) Nomenclature of items for which stowage facilities were not provided.
 - (6) Any difficulties with the stowage of kits or necessary equipment for installation of kits.
 - (7) Nomenclature of combustible or heat sensitive items which are located near potential sources of ignition or heat damage.
- b. Take general view photographs of all stowed items. Also, photograph any unusual conditions encountered such as nonfit, inaccessibility, or interference.
- c. Remove and restow each stowed item using test participants representative of the 5th to 95th percentile. Record any difficulties encountered and evaluate the following:
- (1) Accessibility of stowed items to crew members.
 - (2) Suitability of location (e.g., items to be used externally occupying valuable interior space or emergency items such as fire extinguishers, NBC gear, etc., not immediately accessible).
 - (3) Adequacy of item/space identification techniques.
 - (4) Interference or potential interference of stowage provisions with operation of the vehicle, weapon, or vehicle subsystems.
- d. Check ammunition stowage provisions for the following human factors engineering design considerations:^{1/}
- (1) Ammunition rack latching mechanisms provided for quick release and require no more than 12 pounds to operate.
 - (2) Vertically stowed ammunition over 40 pounds have floor retainers with sufficient clearance for 95th percentile hand.
 - (3) Tube-type ammunition racks are spring loaded so the round will travel two inches out of the rack when latching mechanism is released or the tube is recessed to facilitate hand grip.
- e. Repeat steps c and d with test personnel wearing the appropriate handwear specified for the operational environment of the vehicle (e.g., arctic mittens) and check for adequate gloved-hand clearance.

^{1/} MIL-HDBK-759, Human Factors Engineering Design for Army Material.

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f. Repeat the above procedures as required to evaluate stowage for each alternate mission/configuration and stowage plan applicable to the test vehicle (para 3.1a).

5.1.2 Data Required. Collect and record data as required in paragraph 5.1.1 using the checklist prepared in accordance with paragraph 3.1b and the appendix for evaluations where appropriate.

5.2 Operating Performance Evaluation.

5.2.1 Method.

a. Conduct the vehicle subtests prescribed by the test plan with the OEM stowed to determine the reliability of stowage facilities and the utility of OEM stowage during vehicle performance tests (endurance, fording, extreme temperatures, etc.).

b. Throughout this phase of testing perform the following:

(1) Visually inspect each stowed item daily or after each shift for evidence of damage.

(2) Remove and restow each stowed item as necessary to simulate combat and combat support operations. Inspect each stowed item prior to restowing.

(3) Check exterior stowage locations for adequacy of drainage or sealing provisions.

(4) Record and photograph indications of damage or unusual wear.

5.2.2 Data Required.

a. Number of miles and courses over which the vehicle was operated.

b. Any damage to stowage facilities or stowed items.

c. Adequacy of drainage and sealing provisions.

d. Maintenance performed on stowage facilities.

5.3 Combat Evaluation.

5.3.1 Method. Visually inspect stowage provisions with OEM installed to insure the following:

a. Location of external OEM does not contribute to an increase of overall vehicle vulnerability.

b. External OEM with the potential for use as a weapon by aggressor forces is not readily accessible or removeable.

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c. Location of stowed item does not place the item in an area of potential danger from crash damage, firing, muzzle blast, damage by ejected ammunition cases or rocket motor exhaust.

5.3.2 Data Required. Photographs and explanations regarding suspect stowed OEM locations.

6. DATA REDUCTION AND PRESENTATION.

a. Analyze the data to assess the utility, accessibility, and safety of the stowage facilities.

b. Compile a list of all discrepancies and difficulties encountered with recommendations for correction.

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APPENDIX
CHECKLIST GUIDE FOR STOWAGE EVALUATION

ITEM	YES	NO	NA	COMMENTS
1. Tight fitting stowage is avoided.				
2. Identification and orientation of the item within its stowage facility is obvious or labeled.				
3. Ammunition is easily stowed in racks.				
4. Catches, fasteners lock and unlock easily.				
5. Cover opening procedures are permanently displayed if opening is not obvious.				
6. Tabs and grasp points for opening are clearly identifiable.				
7. Edges and corners on covers and cases are rounded or otherwise finished to prevent personnel injury.				
8. Opened containers or fastenings do not create obstacles or hazards.				
9. Stowage facility minimizes the possibility of damage to stowed item.				
10. Stowage is available for all items.				
11. Glass containers are avoided for field usage.				
12. Accessibility of stowed equipment reflects its function and use.				

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ITEM	YES	NO	NA	COMMENTS
13. Ammunition is easily identified by type.				
14. Stowage does not interfere with vehicle, weapon, or vehicle subsystem operation.				
15. Flammable items are stowed away from engines, generators and exhaust pipes.				
16. Gloved hand clearance is provided for the 95th percentile gloved hand.				
17. Vertically mounted ammunition exceeding 40 pounds has floor retainer with sufficient clearance for 95th percentile hand.				
18. Ammunition rack latches provide for quick release and operate with no more than 12 pounds of force.				
19. Ammunition is easy to remove from racks and adequate clearance exists to permit smooth and swift loading of the weapon.				
20. Removal of one or more stowed items is not necessary to gain access to another stowed item.				
21. Stowage does not present a tripping hazard.				

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