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19. ABSTRACT (Continue on reverse if necessary and identify by block number)
This document describes procedures for evaluating the fording ability of military tracked vehicles as well as the effectiveness of fording kits. Fording capability for tactical vehicles is critical to movement of military units across rivers, streams, and other small bodies of water when bridges and bridging devices are not available. The types of fording covered in this document are shallow water, deep water, and underwater fording. Keywords:

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

AMSTE-RP 702-101
*International Test Operations Procedure (ITOP) 2-2-612(1) 18 May 1987
AD No.

TRACKED VEHICLE FORDING

NOTE: This International Test Operations Procedure (ITOP) is the result of agreement among France, Germany, the United Kingdom, and the United States, 10 April 1987. Any ratifying nation may issue supplemental testing information to amplify or clarify these procedures, but in no case will such information contravene the provisions of this ITOP. Any changes to this ITOP require the approval of all ratifying nations. If a ratifying nation must deviate from a provision of this ITOP due to constraints such as available facilities, national regulations, instrumentation accuracies, etc., the test methods used will be described in the test report. However, such deviation may cause nonacceptance of test data by other nations.

*This ITOP supersedesITOP 2-2-612(1) dated 20 March 1987.

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1. SCOPE.

a. This document describes procedures for evaluating the fording ability of military tracked vehicles as well as the effectiveness of fording kits. Fording capability for tactical vehicles is critical to movement of military units across rivers, streams, and other small bodies of water when bridges and bridging devices are not available.

b. Types of fording covered by this procedure are as follows:

(1) Shallow-water. The vehicle air intake and driver are not under water, and no special kit application is required.

(2) Deep-water. This condition may require the application of a kit containing seals and snorkels. One or more hatches are always above water for use as an escape route and for visual observations.

(3) Underwater. The vehicle is operated under the surface of the water and requires snorkels for engine and/or crew compartments.

2. FACILITIES AND INSTRUMENTATION.

2.1 Facilities.

a. Fording basin

b. Safety equipment, as applicable

c. Recovery equipment

d. SCUBA diving equipment

2.2 Instrumentation.

DEVICES FOR MEASUREMENT OF:	PERMISSIBLE ERROR OF MEASUREMENT* (under stated test conditions)
a. Water depth	± 2cm
b. Depth of water leakage	± 0.5cm
c. Engine speed	± 1% of maximum speed
d. Vehicle speed	± 0.2km/hr
e. Time	± 1 second
f. Temperature	± 1°C
g. Toxic fumes	± 2% of reading

*The perm ssible error measurement for instrumentation is the two-sigma value for a normal distribution; thus, the stated errors should not be exceeded in more than one measurement of 20.

3. REQUIRED TEST CONDITIONS.

3.1 Test Vehicle. Ensure that:

a. The vehicle is loaded with normal payload or combat weight, unless otherwise specified.

b. Maintenance and service operations have been performed to ensure that the vehicle is operating within specifications. Give particular attention to bilge pumps, intake and exhaust systems, turret and hatch seals, and all openings in hull or bulkheads.

c. Reference fuels and lubricants as specified by relevant NATO authority (after ratification) have been used. Until NATO agreement is ratified, developer-specified petroleum, oil, lubricants (POL) will be used.

d. The proper quantities of lubricants have been used.

e. Samples of lubricants from components such as engine, transmission, and final drive have been taken prior to fording operations.

3.2 Test Course. Fording basin shall be filled to required depths for shallow-water, deep-water, and underwater fording operations.

4. TEST PROCEDURES.

4.1 Shallow-water Tests.

4.1.1 Fording.

a. Adjust water level to the maximum required.

b. Drive the vehicle slowly into the water.

c. Check for major water leakage.

d. Remain in water for a period of at least 15 minutes if no major water leakage is noted; during this time, stop the engine several times, and determine restarting capability unless restricted by technical manuals or design limitations.

e. Observe total amount of water leakage into the hull, and measure depth of such leakage, if appropriate.

f. Drive the vehicle slowly out of the water.

g. If appropriate, operate the vehicle, and functionally check steer control and braking ability.

h. Take samples of lubricants for analysis and comparison with those taken before fording relative to water contamination.

4.1.2 Speeds.

a. Drive the vehicle via available ramps into the water at a slow speed.

b. Observe the critical openings (air intake) of the vehicle for entering surge water.

c. Attempt vehicle operation in the basin at increased speeds up to the maximum obtainable safe speed. Care should be taken not to reach speeds that could force water into the air-intake system.

d. Drive the vehicle via available ramps out of the water at a slow speed.

e. Increase the speeds for entering and exiting the water via available ramps until the maximum safe speeds are determined.

4.2 Deep-water Tests.

a. Install the fording kit, and make all required preoperational adjustments and checks.

b. Ensure that all safety equipment has been provided and all precautions have been taken relative to crew safety.

c. Conduct tests as in paragraphs 4.1.1a through 4.1.1h if the fording kit has an underwater start capability; if it does not have such capability, maintain specified engine speed during fording operations.

4.3 Underwater Tests.

a. Install the fording kit and make all required adjustments and checks.

b. Follow all of the procedures, and perform all of the checks used for shallow- and deep-water tests.

c. Conduct tests based on vehicle specifications.

d. Take toxic-fumes measurements in the crew compartment while the vehicle is under water.

e. Monitor coolant and/or lubricant temperatures during fording operations.

5. DATA REQUIRED.

5.1 Shallow-water Tests.

a. Water depth.

b. Time in water.

c. Observations and depth of water leakage.

d. Observations of restarting capability.

e. Observations of steer control and braking.

f. Water contamination of lubricants.

g. Vehicle speed.

h. Ramp angle.

5.2 Deep-water Tests.

a. Personnel and time required to install and remove kit.

b. Adequacy of bilge pumps.

c. Engine speed.

d. All items in 5.1a through 5.1h.

5.3 Underwater Tests.

a. Toxic-fumes concentrations.

b. All items in 5.2a through 5.2d.

6. PRESENTATION OF DATA.

a. Table of results.

b. Report of observations.

Recommended changes to this publication should be forwarded to: Commander, U.S. Army Test and Evaluation Command, ATTN: AMSTE-TC-M, Aberdeen Proving Ground, MD 21005-5055; Bundesamt fuer Wehrtechnik und Beschaffung (BWB), AT III 2, 5400 Koblenz, West Germany; H/TE RARDE(CH), ATTN: M/TD TE2, Chobham Lane, Chertsey, Surrey, England; and Direction des Armements Terrestres, Caserne Sully, DAT/AI/RE, 92211 Saint-Cloud Cedex, France. Technical information may 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.