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Material Test Procedure 7-4-011
U. S. Army Arctic Test Center

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

ARCTIC ENVIRONMENTAL TEST OF
PERSONNEL AND CARGO PARACHUTES

1. OBJECTIVE

→ The objective of the procedures outlined in this MTP is to provide a means of evaluating the performance of personnel and cargo parachutists under arctic winter environmental conditions. ↑

2. BACKGROUND

Engineering tests of personnel and cargo parachutists are conducted to determine the characteristics and performance of the parachutists under various conditions of operation, and to ensure their compliance with specified requirements. Testing in a natural arctic winter environment is used to substantiate or supplement data obtained from simulated tests conducted during the Engineer Design and Engineering Test phase.

Testing in the arctic environment generally is not authorized until data from simulated environment tests provides reasonable assurance that the test item will function satisfactorily when subjected to the conditions that would be encountered in the arctic.

3. REQUIRED EQUIPMENT

- a. Appropriate Arctic winter uniforms and individual field gear.
- b. Support aircraft.
- c. Drop zone.
- d. Air drop platforms and containers (cargo).
- e. All general and special tools and ancillary items required to perform maintenance on the test item.
- f. Test equipment as required.
- g. Photographic equipment (black and white or color).
- h. Meteorological support facility.
- i. Aviations facility and airfield.
- j. Rigging area.
- k. Aircraft loading area.
- l. Loading equipment (Forklift, K-loader, etc.).
- m. Instrumentation for measuring peak force at impact.
- n. Instrumentation for measurement of:
 - 1) Aircraft true airspeed and release velocity.
 - 2) Altitude.
 - 3) Rate of descent.
 - 4) Appropriate rigging equipment.
- o. Communications equipment (DZ control and rigging area).

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4. REFERENCES

- A. AR 705-15, Operations of Materials Under Extreme Conditions of Environment
- B. AR 705-5, Army Research and Development
- C. AR 70-10, Army Material Testing
- D. AR 70-8, Human Factors and Social Sciences Research
- E. USATECOM Regulation 705-2, Documenting, Test Plans and Reports
- F. USATECOM Regulation 350-6, Training in New or Modified Equipment and Training Devices
- G. MTP 10-4-500, Arctic Preoperational Inspection, Physical Characteristics, Human Factors, Safety and Maintenance Evaluation

5. SCOPE

5.1 SUMMARY

The procedures outlined in this MTP are designed to determine and evaluate the functioning characteristics of personnel and cargo parachutes under arctic winter environmental conditions.

The specific tests to be performed and their intended objectives are listed below:

a. Preoperational Inspection and Physical Characteristics - This subtest provides for an inspection of the test item to determine:

- 1) If the test and comparison (control) items are in proper condition for testing.
- 2) If the test items physical characteristics conform to applicable criteria.

b. Packing and Rigging - The objective of this subtest is to determine the ease of packing personnel and cargo parachutes and rigging of cargo parachutes to loads.

c. Aerial Delivery - The objective of this subtest is to determine the suitability of the test item for parachute operations under arctic winter environmental conditions.

d. Human Factors Engineering - The objective of this subtest is to determine if all accessories and components of the test item enable easy operation by test personnel wearing the appropriate arctic winter uniform.

e. Maintenance Evaluation - The objective of this subtest is to determine if the test parachutes meet maintenance and reliability requirements as defined by QMR, SDR, TC or other established criteria under arctic winter environmental conditions.

5.2 LIMITATIONS

The procedures described in this MTP are limited to the testing of personnel and cargo parachutes under arctic winter environmental conditions. Specific tests for other types of parachutes may be performed using this MTP

as a guide with variations applicable to the parachute being tested.

6. PROCEDURES

6.1 PREPARATION FOR TEST

a. Since arctic winter environmental tests are normally scheduled from October through March (6 months), ensure that the test items, test and comparison parachutes are delivered to the Arctic Test Center prior to 1 October.

b. Request TDY personnel, trained MOS 43E2P, be assigned to augment personnel in use of personnel and cargo chutes.

c. Ensure that all test personnel are familiar with the required technical and operational characteristics of the item under test, such as stipulated in Qualitative Material Requirements (QMR), Small Development Requirements (SDR), and Technical Characteristics (TC), and record this criteria in the test plan.

d. Review all instructional material issued with the test item by the manufacturer, contractor, or government, as well as reports of previous tests conducted on the same type of equipment, and familiarize all test personnel available for reference.

e. Record the grade, MOS, background, and training of all test personnel and ensure that all personnel receive new equipment training (NET) as referenced in 4.F.

f. Record the following information:

- 1) Nomenclature, serial number(s), and manufacturer's name of the test items.
- 2) Nomenclature, serial number(s), accuracy tolerances, calibration requirements, and last date calibrated of the test equipment selected for the tests.

g. Select test equipment ideally having an accuracy 10 time greater than that of the function to be measured.

h. Prepare record forms for systematic entry of data, chronology of test, and analysis in final evaluation.

i. Prepare adequate safety precautions to provide safety for personnel and equipment, and ensure that all safety SOP's are observed throughout the test. Ensure that a Safety Release has been obtained prior to test conduct.

j. Outfit all test personnel in appropriate arctic winter clothing as described in MTP 10-4-500.

k. Ensure that when not in use, all test and comparison parachutes are stored and maintained in a heated sheltered area.

l. Record the prevailing meteorological conditions during the storage phase, as well as test conduct, to include:

- 1) Temperature.
- 2) Humidity, relative or absolute.
- 3) Temperature gradient.
- 4) Atmospheric pressure.
- 5) Precipitation.

- 6) Solar radiation.
- 7) Wind speed and direction.
- 8) Frequency of readings.
- 9) Source of data.
- 10) Time in storage.

6.2 TEST CONDUCT

NOTE: As a minimum 15 each of test and comparison parachutes shall be used for the test.

6.2.1 Preoperational Inspectional and Physical Characteristics

Upon receipt, carefully inspect all test and comparison parachutes and their shipping or packaging containers for completeness, damage and general conditions in accordance with the applicable sections of MTP 10-4-500.

6.2.2 Packing and Rigging

- a. Emplace the unpacked parachute on the packing table in proper layout.
- b. Position an observer (with stopwatch) on left side of packing table.
- c. Order the test personnel to commence packing.
- d. Record the following data:
 - 1) Proper fold of gores.
 - 2) Ease of stowing suspension lines.
 - 3) Ease of stowing canopy and installing temporary locking pins.
 - 4) Ease of stowing flaps and pilot chute.
 - 5) Time to pack the parachute (in minutes).
 - 6) Difficulties encountered using packing and rigging tools.
- e. Repeat the above steps using the comparison parachutes.
- f. Position observers (with stopwatches) on each side of a loaded platform or container.
- g. Order the test personnel to commence rigging the test cargo parachute to the load.
- h. Record the following data:
 - 1) Ease of rigging the test parachute to the load.
 - 2) Time required to attach the test parachute to the load.
 - 3) Type of cargo parachute.
 - 4) Type of container or platform.

6.2.3 Aerial Delivery

6.2.3.1 Personnel Parachute

- a. Carefully inspect each test and comparison parachute for loose, damaged or missing parts, and place in the best possible serviceable condition.

b. Subject the test and comparison parachutes to a minimum of five parachute jumps under the following conditions:

- 1) Each parachutist shall be equipped with standard equipment and shall jump in accordance with the latest TM's.
- 2) All test and comparison parachutes shall be inspected before and after each jump.

NOTE: Each phase of the subtest shall be conducted in ambient air temperatures of 0°F to -25°F, -25°F to -45°F and -45°F to the lowest available temperature.

c. Record the following data:

- 1) Altitude and speed of delivery aircraft.
- 2) Ambient air temperature.
- 3) Results of inspections.
- 4) Malfunctions of test and comparison parachutes.
- 5) Damage and deterioration to parachute.
- 6) Photographic coverage.
- 7) Drop zone conditions (terrain, cover, etc.).
- 8) Meteorological conditions (wind speed and direction).
- 9) Functional Suitability.
- 10) Compatibility with parachute equipment.
- 11) Rate of descent.
- 12) Total down time.

6.2.3.2 Cargo Parachutes

a. Carefully inspect each test and comparison parachute for loose, damaged or missing parts and place in best possible serviceable condition.

b. Conduct air drops as directed by the test directive from 500 feet to 2,250 feet and at airspeeds from 50 knots to 150 knots.

c. Conduct air drops as directed using minimum and maximum weights and appropriate parachutes.

NOTE: Each phase of the subtest shall be conducted in ambient air temperatures of 0°F to -25°F, -25°F to -45°F and -45°F to the lowest available temperature.

d. Record the data as described in paragraph 6.2.3.1c, and include the following:

- 1) Impact velocity.
- 2) Peak acceleration.
- 3) Type of air drop.
- 4) Damage to test item.
- 5) Weight of rigged loads.
- 6) Method of attachment of cargo to parachutes.
- 7) Type of parachute.

6.2.4 Human Factors Engineering and Safety

- a. Conduct all Human Factors Engineering and Safety tests in accordance with the applicable sections of MTP 10-4-500.
- b. Conduct these tests concurrently with the operational tests (Packing and Rigging, and Aerial Delivery as described in this MTP).

6.2.5 Maintenance Evaluation

- a. Conduct all maintenance evaluation tests (maintenance and reliability) in accordance with applicable sections of MTP 10-4-500.
- b. Conduct these tests concurrently with the operational tests as described in this MTP.

6.3 TEST DATA

All test data to be recorded will be as specified in the individual subtests of this MTP.

6.4 DATA REDUCTION AND PRESENTATION

Processing of raw test data shall, in general, consist of organizing, marking for identification and correlation, and grouping the test data according to test title.

Specific instructions for the reduction and presentation of individual test data are outlined in the succeeding paragraphs.

6.4.1 Preoperational Inspection and Physical Characteristics

Preoperational inspection and physical characteristics data shall be reduced and presented in accordance with MTP 10-4-500.

6.4.2 Packing and Rigging

The data obtained from the test shall be compared with appropriate QMR's, SDR's, TC's and accepted military standards.

6.4.3 Aerial Delivery

The suitability of the item under test for airborne operations under arctic winter environmental conditions shall be determined by comparison with previously accepted items of like nature and specifications. The damage to and/or malfunctions of the parachute attributed to parachute jumps or air drops contained in appropriate QMR or TC.

6.4.4 Human Factors Engineering and Safety

Human Factors and Safety data shall be reduced and presented in accordance with MTP 10-4-500.

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6.4.5 Maintenance Evaluation

Maintenance data shall be reduced and presented in accordance with
MTP 10-4-500.