NATO STANDARDIZATION AGENCY
AGENCE OTAN DE NORMALISATION

15 June 2010 NSA/0638(2010)-JAIS/4375

See CNAD AC/326 STANAG distribution

STANAG 4375 JAIS (EDITION 3) – SAFETY DROP, MUNITION TEST PROCEDURE

References:

a. NSA/0390-PPS/4375 dated 15 April 2003
b. PFP(AC/326)D(2008)0004 dated 9 September 2008

1. The enclosed NATO Standardization Agreement, which has been ratified by nations as reflected in the NATO Standardization Document Database (NSDD), is promulgated herewith.

2. The references listed above are to be destroyed in accordance with local document destruction procedures.

ACTION BY NATIONAL STAFFS

3. National staffs are requested to examine their ratification status of the STANAG and, if they have not already done so, advise the Defence Investment Division through their national delegation as appropriate of their intention regarding its ratification and implementation.

Juan A. MORENO
Vice Admiral, ESP(N)
Director, NATO Standardization Agency

Enclosure:
STANAG 4375 (Edition 3)

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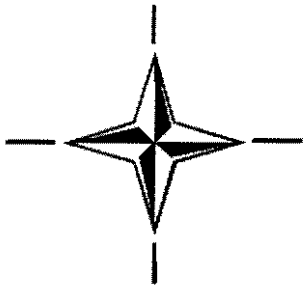
NORTH ATLANTIC TREATY ORGANIZATION (NATO)



NATO STANDARDIZATION AGENCY (NSA)

STANDARDIZATION AGREEMENT (STANAG)

SUBJECT: SAFETY DROP, MUNITION TEST PROCEDURE

Promulgated on 15 June 2010

Juan A. MORENO
Vice Admiral, ESP(N)
Director, NATO Standardization Agency

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(Edition 3)

RECORD OF AMENDMENTS

No.	Reference/date of Amendment	Date Entered	Signature

EXPLANATORY NOTES

AGREEMENT

1. This STANAG is promulgated by the Director NATO Standardization Agency under the authority vested in him by the NATO Standardization Organisation Charter.

2. No departure may be made from the agreement without informing the tasking authority in the form of a reservation. Nations may propose changes at any time to the tasking authority where they will be processed in the same manner as the original agreement.

3. Ratifying nations have agreed that national orders, manuals and instructions implementing this STANAG will include a reference to the STANAG number for purposes of identification.

RATIFICATION, IMPLEMENTATION AND RESERVATIONS

4. Ratification, implementation and reservation details are available on request or through the NSA websites (internet http://nsa.nato.int; NATO Secure WAN http://nsa.hq.nato.int).

FEEDBACK

5. Any comments concerning this publication should be directed to NATO/NSA – Bvd Leopold III - 1110 Brussels - BE.

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NATO STANDARDIZATION AGREEMENT (STANAG)

SAFETY DROP, MUNITION TEST PROCEDURE

Annex:

A Alternative Logistic Drop Test Procedure

Related documents:

AECP-1	MECHANICAL ENVIRONMENTAL CONDITIONS TO WHICH MATERIEL INTENDED FOR USE BY NATO FORCES COULD BE EXPOSED
AECTP-200	ENVIRONMENTAL TESTING – DEFINITIONS OF ENVIRONMENTS
AOP-38	SPECIALIST GLOSSARY OF TERMS AND DEFINITIONS ON AMMUNITION SAFETY
STANAG 4123	DETERMINATION OF THE CLASSIFICATION OF MILITARY AMMUNITION AND EXPLOSIVES – AASTP-3
STANAG 4297	GUIDANCE ON THE ASSESSMENT OF THE SAFETY AND SUITABILITY FOR SERVICE OF MUNITIONS FOR NATO ARMED FORCES – AOP-15
United Nations Document (UN) ST/SG/AC.10/11	RECOMMENDATION ON THE TRANSPORT OF DANGEROUS GOODS, MANUAL OF TESTS AND CRITERIA (UN TEST 4 (B) (II))

AIM

1. The aim of the agreement is to provide standard test procedures to assess the effect of unintentional drops of munitions.

AGREEMENT

2. Participating nations agree that the procedures incorporated in this STANAG will be used for assessing the reaction, if any, of munitions and weapon systems to accidental drops, and that national orders, manuals and instructions implementing this STANAG will include a reference to the STANAG number for purpose of identification.

DEFINITIONS

3. For the purpose of this document, the definitions of terms to be used to describe test events are provided in AOP-38.

GENERAL

4. Purpose. The main objective of these drop tests is to determine if munitions can withstand shocks caused by drops onto a hard surface and remain safe for handling and use or safe for disposal.

DETAILS OF THE AGREEMENT

5. Application. This STANAG provides guidance and procedures for drop tests. They should be conducted as a part of the Safety and Suitability for Service (S^3) assessment of munitions by nations (see STANAG 4297). They may also be used for Hazard Classification (HC) as required by STANAG 4123, and other applications not covered by these STANAGs, but where the response of a munition to drops (12 m, or as otherwise identified in a life cycle profile) is required to be known. When intended to satisfy HC requirements, the test plans should be coordinated with appropriate authorities in this area.

6. Limitations. This STANAG does not specifically cover/address the following impact situations, however, information gained from the procedure herein may be of value in assessing such impacts:

a. drop tests with a horizontal velocity component such as parachute drops or drops from moving vehicles;

b. the impact of items falling on a munition;

c. impact caused by jettisoning munitions from aircraft.

7. Test facility

a. The test facility shall provide a release mechanism such that the test item can be reliably dropped from a given height onto a steel impact surface.

b. Guidance system.

(1) The attitude at point of release shall be such as to ensure the test item impacts in/at the prescribed orientation.

(2) Various guidance systems that do not unacceptably reduce the impact velocity may be used to ensure a proper impact orientation. Such guidance systems must disengage at a sufficient time before impact to allow unimpeded fall and rebounding.

(3) If guidance systems are used which reduce the impact velocity, the drop height shall be adjusted to give the required free fall velocity.

c. Test surface

(1) The impact surface shall be a smooth steel plate, at least 75 millimetres thick. It shall be sufficiently large to receive the dropped munition and, if possible, to accommodate any secondary impact, for example, from the munitions toppling. Its Brinell hardness must be 200 or higher. The plate shall be bonded to, and supported throughout, by a minimum of 600 millimetres of reinforced concrete of a minimum compressive strength of 28 MN/m^2. The combination of concrete and the plate must be constructed such that no free water is retained on top of the plate. Any ice or debris shall be removed from the impact surface prior to testing. The plate shall be horizontal to within two degrees, and shall be positioned to facilitate safe handling of dropped munitions.

(2) The plate surface shall be flat and level with the surrounding surface, and not deformed from previous impacts to the point that it affects the impact angles, or causes separation from the concrete support.

(3) Existing and still useable drop facilities commonly consist of a large concrete block, effectively 20 times the mass of the test item, and faced with a steel plate. However, construction of new facilities should be in accordance with the above requirements.

d. Drop test facility and other equipment

Facility	Requirement
Temperature Chamber	Capable of pre-conditioning the test item to the extremes of temperature

Drop test facility	Tower, derrick, boom, etc., to achieve the required drop height and impact situations, and of sufficient stiffness to ensure a controlled drop
Quick-release mechanism	Capable of releasing the test item without imparting rotation
X-Ray equipment	As required

TEST PROCEDURE

8. Procedure 1 Logistic Drop

Drop Height: For reasons of standardisation, the minimum drop height for the logistic drop tests is 12m. This height may be increased appropriately if so identified in the life cycle profile.

9. Procedure 2 Deployment Drop

Drop Height: The drop height is derived from deployment drop situations identified by the Threat Hazard Assessment (THA). Normally, the drop height will not be greater than 3m.

10. Procedure 3 Alternative Logistic Drop

Where the THA indicates that the impact conditions may be more severe than the standard tests defined in paragraphs 8 and 9, e.g., intrusion of a spike or spigot into the munition, National Drop Test procedures should be used.
See Annex A.

11. Test conditions

a. Test item configuration: The test item shall be in the most vulnerable drop configuration, either packaged or unpacked, which represents the worst case situation derived from the THA. The test item must be to the full production standard, although non-explosive sections of the item need only be geometrically and structurally representative. For all-up rounds that contain more than one major energetic component (such as rocket motors and warheads), the energetic components may be tested either individually or as an all-up round.

b Impact surface: The test item shall be dropped onto a surface that meets the requirements of paragraph 7.c.

c. Orientation and number of drops:

(1) Logistic drop:

Three separate drops, at different impact orientations, are required. Unless analysis, or previous test history, indicates differently, the following series of drops is commonly used. The test item, either packaged or unpacked, is to be released such that it will approximate an initial impact in the following orientations:

- major axis vertical, nose down ↓;
- major axis vertical, base down ↑;
- major axis horizontal, →;

Where more than one drop test is performed, these shall be carried out in order of decreasing likelihood of producing unwanted events. No test item shall be dropped more than once.

(2) Deployment drop:

Five separate drops, at different impact orientations, are required. Unless analysis, or previous test history, indicates differently, the following series of drops is commonly used. The test item, either packaged or unpacked, is to be released such that it will approximate an initial impact in the following orientations:

- major axis vertical, nose down ↓;
- major axis vertical, base down ↑;
- major axis horizontal, →;
- 45^0 major axis nose down ;
- 45^0 major axis base down

Where more than one drop test is performed, these shall be carried out in order of decreasing likelihood of producing unwanted events. No test item shall be dropped more than once.

d. Pre-conditioning: Any pre-conditioning of the test item for the test should simulate the likely worst case temperature conditions at the moment of a free fall in the service environment. The temperature to which the test item should be conditioned must be derived from the life cycle analysis, and should represent temperatures expected to make the test item most sensitive to impact. If no actual data on service life environmental conditions are available, the levels stated in AECTP-200 may be used as fallback levels for temperature conditioning. The time lapse between removal of the test item from the conditioning chamber and the drop test shall be sufficiently short to avoid unacceptable temperature change or icing on the item. When pre-stressing the test item at environmental

severities to be encountered during operational use is expected to result in an increased sensitivity to impact, the test item should be pre-stressed prior to test. Environmental severities for pre-stressing can be developed from AECP-1 or AECTP-200.

e. Test controls and accuracy. The accuracy of the test parameters shall be as follows:

Test Parameter	Tolerance
Drop Height	1 %
Angular deviation of test item from the required position on impact	+/- 10 degrees
Test item temperature goal	+/- 5°C

OBSERVATIONS AND RECORDS

12. The following measurements and observations are to be made and records kept:

Measurements and observations	Required	Optional
Environmental before trial		
Environmental pre-conditioning performed on the test item	Yes	
Previous tests to which the test item has been submitted	Yes	
Specimen		
Test item identification (model, lot numbers, serial numbers, number of test items, etc.)	Yes	
Type of energetic material and weight before the trial	Yes	
Identification of axes	Yes	
Orientation of the test item at impact	Yes	
The nature of any reactions by the test item, including indication of propulsion	Yes	
The general condition of the test item, including packaging, after the test	Yes	
A record of events versus time during the trial	Yes	

Measurements and observations	Required	Optional
Specific test measurements		
Thermocouple data (versus time during pre-conditioning) for all sensors	Yes	
Audio/Video/Photographs		
Video recording, with audio	Yes	
High-speed video recording		Yes
Photographs of the test set-up and specimen before and after test	Yes	

IMPLEMENTATION OF THE AGREEMENT

13. This STANAG is considered to be implemented by a nation when that nation has issued the necessary orders / instructions:

a. that all future munitions and weapon systems will be assessed / tested in accordance with this agreement;

b. to provide its NATO forces with the details in this agreement with reference to this STANAG.

14. Data developed in accordance with this STANAG shall be made available to other NATO Nations participating in a collaborative weapon development or procurement program, upon receipt of a request submitted through appropriate National channels.

ANNEX A AU
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ALTERNATIVE LOGISTIC DROP TEST PROCEDURE

When indicated by hazard assessment the following National Drop Test procedures should be used:

BEL:	
BUL	
CAN:	
CZE:	
DNK:	
EST:	
FRA:	INSTRUCTION TECHNIQUE 9282-3
DEU:	
GRC:	
HUN:	
ITA:	
LVA	
LTU:	
NLD:	
NOR:	
POL:	
PRT:	
ROU:	
ESP:	
TUR:	
GBR:	Def Stan 00-35
USA:	