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NSA

20 October 2011 NSA-1011(2011)LMCS/4423

See CNAD AC/326 STANAG distribution

STANAG 4423 (EDITION 2) – CANNON AMMUNITION (12.7 TO 40 MM) - SAFETY AND SUITABILITY FOR SERVICE EVALUATION

References:
a. NSA/12300393-PPS/4423 dated 15 April 2003
b. PFP(AC/326)D(2009)0005, 12 May 2009

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.

Cihangir AKSIT, TUR Civ
Director, NATO Standardization Agency

Enclosure:
STANAG 4423 (Edition 2)

STANAG 4423
(Edition 2)

NORTH ATLANTIC TREATY ORGANIZATION

(NATO)

NATO STANDARDIZATION AGENCY
(NSA)

STANDARDIZATION AGREEMENT
(STANAG)

SUBJECT: CANNON AMMUNITION (12.7 TO 40 MM) - SAFETY AND SUITABILITY FOR SERVICE EVALUATION.

Promulgated on 20 October 2011

Cihangir AKSIT, TUR Civ
Director, NATO Standardization Agency

STANAG 4423
(Edition 2)

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 - Belgium.

STANAG 4423
(Edition 2)

NATO STANDARDIZATION AGREEMENT (STANAG)

CANNON AMMUNITION (12.7 TO 40 MM) - SAFETY AND SUITABILITY FOR SERVICE EVALUATION.

Annexes

A Standard (Mandatory) Tests

B Supplementary Tests.

Related Documents:

AECP-I	Mechanical Environmental Conditions.
AECTP 200	Environmental Conditions
AECTP 300	Climatic Environmental Tests.
AECTP 400	Mechanical Environmental Tests.
AOP 15	Guidance on the Assessment of the Safety and Suitability for service of non nuclear Munitions for NATO Armed Forces.
AOP 24	Electrostatic Discharge, Munitions Assessment and Test Procedures.
AOP 25	Rationale and guidance concerning STANAG 4327-Lightning, Munitions Assessment and Test Procedures.
STANAG 1307	Maximum NATO Naval Operational Electromagnetic Environment Produced by Radio and Radar.
STANAG 4110	Definition of Pressure Terms and their InterRelationship for use in the Design and Proof of Cannons or mortars and Ammunition.
STANAG 4113	Pressure Measurement by Crusher Gauges.
STANAG 4117	Explosives, Stability Test procedures and Requirements for Propellant stabilized with Diphenylamine, Ethylcentralite or a mixture of both.

STANAG 4123 Determination of the classification of Military Ammunition and explosives-AASTP-3

STANAG 4147 Chemical Compatibility of Ammunition Components with Explosives(Non-Nuclear Applications).

STANAG 4157 Fuzing systems:Test requirements for the assessment safety and suitability for service– AOP 20

STANAG 4170 Principles and Methodology for the Qualification of Explosives Materials for Military Use.

STANAG 4187 Fuzing Systems Safety Design Requirements.

STANAG 4224 Large Calibre Artillery and Naval Gun Ammunition Greater than 40 mm, Safety and Suitability for Service Evaluation.

STANAG 4234 Electromagnetic Radiation (Radio Frequency) - 200 kHz to 40 GHz. Environment - Affecting the Design of Material for Use by NATO Forces.

STANAG 4235 Electromagnetic discharge environment.

STANAG 4236 Lightning Environment

STANAG 4239 Electrostatic Discharge, Munitions Test Procedures – AOP 24.

STANAG 4240 Liquid fuel/external fire, munition test procedures.

STANAG 4241 Bullet impact, munition test procedures.

STANAG 4242 Vibration Test Method and Severities for Munitions carried in Tracked Vehicles - AOP 34.

STANAG 4324 Electromagnetic Radiations (Radio Frequency) Test Information to Determine the Safety and Suitability for Service of Electro-Explosive Device and Associated Electronic Systems in Munitions and Weapons Systems.

STANAG 4327 Lightning, Munitions Assessment and Test Procedure - AOP 25.

STANAG 4363 Fuzing Systems: Development Testing for the Assessment of Lead and Booster Explosive Components.

STANAG 4370 Environmental Testing.

STANAG 4375 Safety Drop, Munitions Test Procedure.

STANAG 4382 Slow heating munitions test procedures.

STANAG 4396 Sympathetic Reaction, Munitions Test Procedure.

AIM

1. The aim of this agreement is to standardize the process for assessment and testing to support the evaluation of the safety and suitability for service of cannon ammunition.

AGREEMENT

2. Ratifying nations agree that environmental and safety testing (including adequate documentation), performed in accordance with this STANAG, is valid for evaluation by the ratifying nations. Further, they agree that the results of environmental and safety tests of cannon ammunition performed in accordance with this document will be provided by the developing nation to participating nations.

DEFINITIONS

3. The following definitions apply for this agreement:

a. Cannon. A Cannon is defined as an automatic gun with a calibre from 12.7 mm to 40 mm together with any associated ammunition feed and storage mechanisms essential to enable the gun to execute automatic feed, loading and/or (re) firing operations.

b. Cannon Ammunition. Cannon ammunition is defined as that ammunition which is designed to be loaded into and fired from a cannon.

c. Pressure terms. The pressure related terms and definitions used in the document conform to STANAG 4110 with the following additions:

(1) System Design Pressure (System DP): the value of Cannon DP or Projectile DP (whichever is the lower) for a specified system.

(2) Chamber Pressure: the pressure existent within the weapon chamber at any time as a result of the burning of the propellant charge. With some pressure gauges (crusher), only the peack pressure can be measured.

d Lower Conditioning Temperature (LCT). The temperature to which test items are stabilized for cold tests. This temperature is based on the climatic region that the testing nation and the using nation predict to be the worst-case cold environment that the test item will encounter during storage and transportation (See Table 1).

e Lower Firing Temperature (LFT). The temperature to which test items are stabilized for cold test firing. This temperature is based on the climatic region that the testing nation and the using nations predict to be the worst-case cold firing environment that the test item will encounter during operations (See Table 1).

f Upper Conditioning Temperature (UCT). The temperature to which test items are stabilized for hot tests. This temperature is based on the climatic region that the testing nation and the using nations predict to be the worst case hot environment that the test item will encounter during storage and transportation: (See Table 1).

g Upper Firing Temperature (UFT). The temperature to which the test items are stabilized for hot test firing. This temperature is based on the climatic region that the testing nation and the using nations predict to be the worst-case hot firing environmental that the test item will encounter during operations. (See Table 1).

h Safety:

Situation: an acceptable level of freedom from risk to personnel and material at all time.

Materiel: the inherent propriety of a system, subsystem or item that enables it to possess and to maintain an acceptable level of risk during all situations and activities occurring during its specified life cycle. Safety state is the situation wherein the overall risks are acceptable.

i Suitability for Service. A general term used to summarize the requirements for a munition to be acceptably free from hazards and to have inherent characteristics that meet specified requirements during its agreed life cycle. It does not include operational effectiveness.

j Muzzle Velocity (Mv). The velocity of the projectile at exit of the projectile base from the muzzle of the barrel (including any muzzle brake or similar devices if fitted).

k Temperature Coefficients. The variations per °C with respect to chamber pressure or MV, as specified. Temperature coefficients are specified in terms of temperature ranges between LFT and UFT.

l Packaged Ammunition. A munition in its full-service logistic packaging.

m Intermediate Packaging. Inner packing for tactical transportation, if applicable.

TABLE 1

CLIMATIC CATEGORY TEMPERATURES

Testing shall be carried out at temperatures representative of the extreme conditions likely to be encountered in service. The Climatic Categories in which the ammunition shall be used, and has been designed and tested for, shall be specified by the nation developing the ammunition. The temperature ranges and diurnal cycles for the various Climatic Categories are given in AECTP-200. The extreme conditioning and firing temperatures to be used during safety testing of ammunition are derived from these and are given below:

Climatic	Conditìonìng (LCT,UCT)	Firing (LFT, UFT)
Category	Temp °C	Temp °C
A1/B3/M1	63	63
A2/B2/M2	63	56
A3	58	52
C1/M3	-33	-33
C2	-46	-46
C3	-51	-51

TABLE 2

CONDITIONING DURATIONS.

The ammunition shall be conditioned until the temperature of the test item has stabilized to +/- 2 deg Celsius of desired test temperature. Minimum conditioning duration is 8 hrs.

Durations are the minimum to achieve the required effect for ammunition either unpackaged or in intermediate packaging and racked separately in a conditioning chamber with good air circulation. Where ammunition shall be conditioned in logistic packaging (such as a Unit Load Container – ULC – or pallet) the conditioning durations should be increased until the temperature of test item has stabilized to ± 2°C of desired test temperature. The conditioning durations (for temperature above 50°C) are not to be extended beyond the total of hrs recommended by the developer.

4 GENERAL

The purpose of testing is to provide the evidence for the evaluation of cannon ammunition with its associated packaging where appropriate to provide confidence that:

a. The cannon ammunition as a whole and its components will remain safe and suitable for service and will function within specified performance limits after being exposed to severe handling and extreme climatic conditions equivalent to those which are likely to be found during storage, transportation, stowage and operation during the entire service life of the munitions, including disposal.

b. The risk of an unintentional explosive event occurring at any point throughout the service life is acceptably low. For example, hazards may arise during functioning of the cannon, or a credible accident, or an otherwise survivable enemy action, or the process of disposal following such an accident, or enemy action, or disposal at the end of life.

c. There is no damaging interaction between the ship, vessel, fighting vehicle, platform, structure, aircraft or helicopter and the cannon, cannon ammunition and/or associated packaging when subjected to service conditions. A different applications of the ammunition or its use in a new system require additional tests result by a new analysis of the risk.

5 DETAILS OF THE AGREEMENT

a Procedures Each nation will be responsible for the evaluation of safety and suitability for service of cannon ammunition to be used by its own Services and for this purpose will, as defined in AOP-15, require copies of the design characteristics, safety analyses and trial reports from the nation responsible for the development of the cannon ammunition being evaluated. The nations carrying out the evaluation of safety and suitability for service on a particular cannon ammunition agree to make their test parameters, safety analyses and trials reports available to other NATO nations intending to purchase or to take over the ammunition, on request.

b UN Classification. Evidence shall be provided by the developing nation that the ammunition has been given a UN Classification valid to its design and packaging in accordance with UN Recommendations on the transport of dangerous Goods and STANAG 4123.

c Fuzes and Safety and Arming Devices. Evidence shall be provided by the developing nation to the requesting nation that the Fuzes and Safety and Arming Devices used have been designed in accordance with STANAG 4187 and AOP 16 and assessed in accordance with STANAG 4157 and AOP 20 respectively. Any deviation from standard procedures and assessment criteria shall be justified in the test programme.

d Temperatures. Conditioning and firing temperatures are given in Table 1; temperature conditioning durations are given in Table 2.

6. VARIATIONS ON THE PROCEDURES

a. Notwithstanding the intention to avoid duplication of testing, each nation reserves the right to carry out additional testing if considered appropriate and, when necessary, to bear the financial costs of so doing.

b. Any significant changes proposed to the agreed evaluation procedures will be provided to the user nation for comment and concurrence; any changes made without the mutual acceptance of the ratifying nations may negate the acceptability to the user nations of the above mentioned agreed evaluation procedures.

c. The service environment to which the cannon ammunition may be subjected will be specified by the user nation. The specific test programme need not be limited to tests described in this document. The selection of tests, test parameters and test sequences shall be based on hazard analysis and the measured, or analytically forecast environmental life cycle profile of the test item, as indicated in AOP-15, to optimise detection possibilities of the expected failures.

d. No individual tests or group of tests can be used to evaluate fully the safety and suitability for service of a munition in isolation. It is agreed that the final evaluation shall take account of development trials, as well as individual national appraisal procedures, in order to make a valid evaluation of the cannon ammunition in the specified service environment.

e. Test Items. Tests should be conducted on the final design of the ammunition which has been manufactured to production standards and is ready to be fielded. Design or production change after fielding shall be identified and supporting infomation to confirm the validity of original tests as affected by these changes shall be provided. Item within the ammunition may be substituted, provided this does not dedract from the purpose of the test or test sequence. The configuration shall be specified in detail in the test plan and reported in the test report.

7 EXPLOSIVES QUALIFICATION AND FINAL (TYPE) QUALIFICATION

Evidence shall be provided by the developing nation that the explosive and propelling charge compositions to be used in the ammunition have been assessed and qualified to the requirements of STANAG 4170. These include propellant stability tests in accordance with STANAG 4117, and chemical/physical compatibility in accordance with STANAG 4147 where appropriate.

8 CANNON AND AMMUNITION INTERACTION

Cannon ammunition may be required to be fired from a number of different types of cannon of the same calibre. The evaluation of such ammunition will need to take account of each set of weapon design criteria (e.g. chamber characteristics) and the environment likely to be seen by the ammunition when being cycled through the cannon feed mechanisms. Consequently it cannot be assumed that a round of ammunition that complies with this STANAG will function safely and satisfactorily in all other cannons of that calibre. Requirements for interchangeability of cannon ammunition are given in STANAGs 1402 and 1405/AOP-27 (Navy), STANAGs 2928/AOP-6 and 4425/AOP-29 (Land), or STANAG 3791/AOP-11 (Air).

9 PRESSURE RELATIONSHIPS AND TERMINOLOGY

The pressure relationships and terminology detailed in STANAG 4110 are relevant and are to be applied to cannon ammunition in this STANAG.

10 ENVIRONMENTS

Environments, which shall be considered for the assessment and testing of cannon ammunition should be selected using the questionnaire at Annex A to AOP- 15 and are summarised as:

a. Natural environments created regardless of human intervention, e.g. temperature, pressure, humidity, sand, lightning or salt spray.

b. Induced environments associated with the handling and transportation of cannon ammunition from manufacture, through storage to loading into deep or ready use magazines or stowage's in a ship, vessel, aircraft, fighting vehicle, or military installation.

c. Induced environments associated with installation and carriage in the ship, vessel, fighting vehicle, fortification or aircraft, feeding into and through the ammunition feed system, loading and firing.

d. Induced electromagnetic and electrostatic environments resulting from human intervention.

e. Hazardous environments associated with enemy action and accidents. e.g. fire, strike by other ordnance or fragments, aircraft crash, handling accidents, etc.

11 LIFE CYCLE

During a manufacture-to-target or disposal sequence (MTDS), cannon ammunition may encounter ground, sea and air environmental conditions. Within these environments, the ammunition, whether packaged or unpackaged, may be subjected to: storage; handling; testing; transportation by road, rail, sea and air; carriage in ships, fighting vehicles and aircraft; loading and firing. The tests required to establish the safety and suitability for service characteristics of the ammunition shall take account of the need to demonstrate the effects of the expected environment on the ammunition during its expected life cycle in accordance with the Operational Requirement.

12 ENVIRONMENTAL SPECIFICATION

To ensure that the environments used during tests are representative, the anticipated environment shall be detailed so that it is consistent with the Operational Requirement and the design specification for the cannon system, i.e. certification that the anticipated environment has been correctly defined needs to be given by the appropriate Operational Requirements Office of the developing nation's Service or Services. This process is defined in AOP-15.

13 OUTLINE OF TEST PROGRAMME

The test programme shall be developed for cannon ammunition based on hazard analysis and the environmental profile as indicated in Paragraphs 6c, 7, 10, 11 and 12. Such a programme will include both standard (mandatory) and supplementary tests, as described in Paragraph 14 below, and the construction of the test programme will include the sequencing of tests to match the MTDS. The selection of tests, test methods, parameters, duration and sequence shall be agreed with the Project Manager or delegated representative and the logic of these choices related to the specified environment shall be documented.

14 STANDARD (MANDATORY) AND SUPPLEMENTARY TESTS

The standard (mandatory) tests are those, which shall be conducted satisfactorily to establish adequate safety and suitability for service during operation of the cannon and in credible accident situations; these are given in Annex A. The applicability of some of these tests is conditional upon the design of the particular ammunition and its intended use in a cannon. Supplementary tests are additional tests to provide further evidence to assess safety and suitability for service to survive a given environment within the specification; these are given in Annex B. All common or specific supplementary tests shall be considered when developing a safety and suitability for service test programme for cannon ammunition.

15 ADDITIONAL TESTS

Further tests, not included in Annex B, may be conducted if considered necessary by the developing authority. In particular, novel ammunition designs may require further tests to be undertaken. Any test intended to assess the response of the cannon ammunition to a particular environment or hazard is to be conducted to simulate satisfactorily that environment or hazard.

16 TEST PARAMETERS

Standard test procedures and test parameters are given in Annexes A and B. Test severities shall be at least in accordance with the minimum requirements presented in or referred to in these Annexes. If the results of analyses lead to more severe testing, or tests not mentioned in these Annexes, the appropriate severities or tests shall be included in the test programme. Nothing in this STANAG should prevent a nation deciding on a higher or more severe criterion if it so wishes. However, the developing nation should be consulted in the event that a more severe test is specified in case the test is outside the specified design parameters of the ammunition. Where there is evidence of unacceptable or unsatisfactory results, the significance of these shall be explained by the developing nation.

17 TEST PROCEDURES

The tests described in Annex A shall be conducted in accordance with ratified test STANAGs. In those instances where appropriate STANAGs have not yet been approved, national procedures will apply until superseded by ratified STANAGs. Non-functional items may substitute items within the ammunition provided this does not detract from the purpose of the test or the test sequence. Such configurations must be specified in the test plan and reported in the test report. Assessment criteria for tests discussed in this STANAG are specified in the respective test section. For other applicable tests identified by this STANAG, the assessment criteria are given in the STANAG for that particular test when available or identified in national procedures.

18 CHOICE OF TEST AND TEST SEQUENCE

Some or all of the tests within the programme are conducted sequentially to verify that the cannon ammunition will be safe and suitable for service in the expected environment. Such sequences may end with destructive functioning, destructive tests or destructive detailed examination. Rounds may be withdrawn at various points for detailed examination to ascertain the effects of specific environments. The detailed design of the cannon ammunition should be critically examined so that the sequence or sequences represent the best compromise between a realistic MTDS and those sequences, which will cumulatively produce the most severe degradation of the rounds under test. The content of test sequences and the number of rounds involved will also be influenced by any similarities with previous designs or by technical innovation in the design.

19 RELATIONSHIP WITH DEVELOPMENT TESTING

Tests on cannon ammunition shall be classified as development or safety and suitability for service tests. It is expected that development tests will also cover the spectrum of tests in Annexes A and B as well as other tests. The essential differences between the two programmes are that ammunition selected for the safety and suitability for service test programme must be fully representative of the production standard and procedures and that such ammunition shall successfully pass the test assessment criteria. The results of development trials carried out with ammunition or components representative of the production build standard may be taken into consideration in the evaluation of safety and suitability for service, providing test data are made available.

20 REPORTS ON SAFETY AND SUITABILITY FOR SERVICE TESTS

It is essential that adequate data are available to national/service safety evaluation organisations for the evaluation of cannon ammunition safety and suitability for service. Therefore nations developing the ammunition system shall compile a data package, which documents the test methods and rationale for the programme selection. Reports should be from accredited test ranges/authorities and carry a satisfactory assurance of quality. The packages will also give the detailed results obtained during safety and suitability for service tests. Where results from development trials have been used to permit fewer rounds in the sequence or to reduce the duration of tests, then the results of these development trials should also be included, providing the aspect of development munitions under test has not been

changed in the production version. This data package shall be supplemented by a technical design data package.

21 PACKAGING TESTS

Most of the safety and suitability for service tests are designed to assess ammunition, where ammunition is tested in packaging which has been separately tested and approved. If this is not the case, additional tests of the packaging should be carried out under international or national test procedures.

22 IMPLEMENTATION OF THE AGREEMENT

This STANAG is considered implemented by a nation when that nation:

a. has revised or issued applicable national documents te agree with the provisions of the STANAG;

b. has issued the necessary order/instructions to its services that all new ammunition will be developed in accordance with the requirements and procedures detailed in this agreement.

STANDARD (MANDATORY) TESTS

1 SAFE FUNCTIONING

a. Reason for Test This test is conducted to demonstrate that the ammunition is sufficiently robust to be cycled through the cannon storage, feed, ramming and extraction mechanism, and that the fired projectile remains safe and suitable for service.

b. Information The test is designed to subject the ammunition to the most severe conditions to be encountered. Production standard ammunition is to be used. The test is to be undertaken with a service cannon and with a representative service ammunition feed system. Sub-calibre projectiles shall remain stable after discarding sabots/pushers. For aircraft mounted cannons, the effects of aircraft forward velocity may be simulated to evaluate the effects on projectile stability. Trajectories of discarding sabots and pushers and the effects of a full aircraft ammunition load firing in one burst should be considered. The test is carried out with cannon system with new and worn barrel (no more than 25% of remaining life) for each type of weapon system for which this ammunition is specified.

c. Test Procedure The test shall be conducted in accordance with national procedures. Such procedures should foreseen as a minimum firing trials with conditioned ammunitions at extreme temperatures and prestressed according to foreseen service environment.

2 STRENGTH OF DESIGN

a. Reason for Test This test is conducted to determine if the non explosive parts of the projectile can successfully withstand the maximum firing stresses.

b. Information For projectile selection and charge preparation and firing the provisions of STANAG 4224 Edition 3 Annex B paragraph 3 and 4 shall be applied.

c. Test Procedure Test in accordance with STANAG 4224 Edition 3 Annex B paragraph 5 Outline (recovery if possible) Paragraph 6 Data (the possibility of recording data of Sub-paragraphs a to n shall be confirmed or not in the Test Plan); Paragraph 7 Assessment Criteria (to be clarified in the Test Plan). Include visual examination of cartridge cases after extraction and note any evidence of deformation, failure of obturation or hard extraction. Witness/target screens/plates or high-speed photography may be used to examine the strength of the projectile.

3 PROPELLING CHARGE SAFETY

a. Reason For Test. This test is conducted to determine if a Propelling Charge is safe and suitable for service use with a specific projectile and cannon system.

b. Information. This test is conducted in two parts with two separate lots of propelling charges and provides the primary evidence to assess whether a propelling charge is safe and suitable for service use. The aim of part 1 is to assure that the propelling charge meets the specification values and is satisfactory for use in further tests. The aim of part 2 is to determine the maximum pressure likely to be obtained in

service: this is compared with System Design Pressure (DP) or System Permissible Maximum Pressure (PMP) to ensure that the charge is not likely to generate dangerous high pressures.

c. Test Procedure. The test shall be conducted in accordance with STANAG 4224 Edition 3 Annex A, with possible modification of data collection and reduction for small calibre ammunition. In any case deviation from STANAG 4224 shall be justified. After the necessary calculation and statistical analysis described in STANAG 4110, Maximum Operating Pressure (MOP) value shall be equal to or less than System PMP. When System PMP has to be reduced in order to accommodate a Proof Pressure (PP) wider than 1.75 sd, or when is not possible to accurately define System PMP the assessment criteria of STANAG 4224 Edition 3 Annex A paragraph 21.b shall be used.

4 HOT GUN COOK-OFF

a. Reason For Test This test is conducted to determine the temperature at which the ammunition wil1 cook-off. It is also to determine whether and, if so, when, cannon ammunition will cook-off when fed into a hot breech.

b. Information The temperature of the store is raised rapidly to determine the temperature at which an event will occur. To establish whether cook-off occurs in the cannon system in use, the cannon must be fired at the maximum rate of fire for the specified duration. Immediately afterwards, either a round is separately inserted, or a round with no primer fitted is fed into the breech. This is to simulate a misfire or other feed/firing system failure. If cook-off occurs, the temperature and time at which it occurs is recorded.

d. Test Procedure The test shall be conducted in accordance with national procedures.

5 SAFETY DROP

a. Reason For Test. This test is conducted to determine the reaction of cannon ammunition to impact and whether it is safe to handle and dispose of by qualified personnel following impact from accidental drops.

b Information. This test simulates an accidental drop of ammunition during logistic activities and deployment activities, with the main objective to determine if ammunition can withstand severe shocks caused by drops onto a hard surface and remain safe for disposal. A safety analysis is required (AOP-15) together with a service environmental profile (AOP-15 and AECTP-1 00). From the service environmental profile, all possible hazardous free fall situations shall be identified. From the safety analysis, the extreme conditions shall be derived under which the munitions shall not function and shall remain safe far disposal. Further from this analysis, if appropriate, the worst-case deployment conditions shall be derived under which the munitions shall not function and shall remain safe far handling and for use in the case of absence of significant damage. For reason of standardization, the minimum drop height for the logistic drop test is 12 m. The height for the deployment drop test normally will not be greater than 3 m. For the logistic configuration this usually includes packaged, in fuzed and unarmed conditions. For the deployment

configuration this usually means unpackaged or in its tactical sub package and unarmed.

c Test Procedure. The test shall be conducted in accordance with STANAG 4375. If modifications should be applied to STANAG procedures for particular ammunition situation and configuration (f.i. PIE rounds). such modifications shall be justified in the test programme.

6 LIQUID FUEL FIRE

a. Reason For Test This test is conducted to determine the reaction of the cannon ammunition to an intense fire (e.g. aircraft/helicopter/vehicle crash). The test is mandatory far any type of ammunition: no acceptance criteria shall be applied because the aim of the test is just to determine the reaction of the ammunition to an intense fire situation.

e. Information. The quantity of fuel should be chosen to ensure that the duration of the fire is sufficient to cause reaction of the store. The severity and time to the reaction will be assessed. In most cases, the test criteria will require that the store does not detonate, or become propulsive during the test, and/or react within a given time. Ammunition may be packaged and/or unpackaged depending on the MTDS sequence.

a. Test Procedure The test shall be conducted in accordance with STANAG 4240.

7 SLOW HEATING

a. Reason For Test This test is conducted to determine the reaction of the cannon ammunition to increasing heat over a long period such as may result from a fire in an adjacent building or compartment.

b. Information. The temperature of the ammunition is raised gradually until a reaction occurs. The reaction of the round may be more severe than that observed during the Liquid Fuel Fire Test because the structure of the munitions may provide containment for the explosives until a higher temperature is reached, or the explosive components may react differently to slow heating regimes.

c. Test Procedure The test shall be conducted in accordance with STANAG 4382; the test is mandatory for any type of ammunition: no acceptance criteria shall be applied because the aim of the test is just to determine the reaction of the ammunition to increasing heat over a long period.

8 BULLET/FRAGMENT ATTACK

a. Reason For Test This test is conducted to determine the reaction of the cannon ammunition to bullet attack and fragment strike.

b. Information. The test is mandatory for any type of ammunition but no acceptance criteria shall be applied because the aim of the test is just to determine the reaction of the ammunition to bullet attack and fragment strike. Standard test

procedure shall be applied for bullet impact: fragment impact test should be carried out according to national procedures (standard test not yet available).

c. Test Procedure. Bullet attack test shall be conducted in accordance with STANAG 4241. Fragment attack test should be conducted in accordance with national procedures (the relevant STANAG 4496 is still in Draft condition).

9 SYMPATHETIC REACTION

a. Reason For Test This test is conducted to determine the reaction of the cannon ammunition to functioning of a round in close proximity to other rounds.

b. Information. This test is mandatory for any type of ammunition but no acceptance criteria shall be specified, because the aim of the test is to determine the reaction, if any, of a munitions to an accidental reaction of the same type of munitions with which it may be stored, placed or carried in close proximity.

c. Test Procedure The test shall be conducted in accordance with STANAG 4396.

10 PROJECTILE SAFETY

a. Reason for Test. This test is conducted to determine if projectiles with HE, other hazardous fillings, and non-hazardous projectiles containing explosive or pyrotechnic components are bore and flight safe. This test provides the preliminary evidence to assess whether a projectile is prone to premature detonation or other reactive material function in the bore or during flight. The test should be carried out after completion of the Strength of Design Test, which assesses the strength of the non-explosive parts of the projectile. The test gives an initial assurance that the projectile is safe before carrying out the Sequential Environmental Test.

b. Information. This test subjects projectiles to pre-stressing by means of drop and bounce tests conducted at the temperature extremes, followed by hot diurnal cycling. Projectiles are then fired at an elevated chamber pressure, acceleration or rate of change of acceleration that the projectile might encounter in service.

c Test Procedure. The Test shall be carried out according to Test Plan, Data to be recorded and Assessment criteria of Annex C to STANAG 4224 Edition 3. Some particular situation/ammunition configuration (particularly for small calibres) together with safety analysis and service environmental profile should require modifications to standard procedures: in any case such modifications shall be fully justified in the Test programme.

11 WORN BARREL

a. Reason for Test The Test is conducted to determine if the non-explosive parts of the projectile can successfully withstand the maximum firing stresses in a worn barrel The test is conducted also to determine if projectiles loaded with HE, other hazardous fillings, and non hazardous projectiles which may or may not contain explosive or pyrotechnic components are bore and flight safe and do not produce erratic flight when fired from a worn barrel.

b. Information. A worn barrel is defined as one that has no more than 25 % of remaining life or other wear condition as specified by the developing nation. Projectiles are fired at UFT and LFT and with propelling charges designed to produce respectively projectile PMP in a new barrel and maximum pressure at LFT in a new barrel

c. Test Procedure The Test shall be carried out according to Test Plan, Data to be recorded and Assessment criteria of Annex D to STANAG 4224 Edition 3. Some particular situation/ammunition configuration (particularly far small calibres) together with safety analysis and service environmental profile should require modifications to standard procedures: in any case such modifications shall be fully justified in the Test Programme.

12 SEQUENTIAL ENVIRONMENTAL

a. Reason for Test This Test is conducted to determine if the safety and suitability for service of the ammunition is adversely affected when is subjected to environmental conditions representative of service use.

b. Information This test is designed to evaluate the effects on the ammunition of logistic and tactical transportation, storage and rough handling and underwater shock, where applicable, which the ammunition might experience in service in the specific climatic extreme conditions. Test schedule simulates manufacture to disposal sequence, which provide a demanding but fair basis on which to judge the safety and suitability for service of the ammunition. The sequential test outline is presented as the mandatory minimum. Additional environmental tests may be included in the sequence dependent on the forecasted life cycle environmental profile. The sequential test outline is divided in two phases (Safety and Performance). The safety portion encompasses the pre-firing environmental and firing conditions representative of the extremes that the test item may experience. The performance phase of the sequential test is a control phase conducted using service charges and projectiles that have not been subjected to the most severe environments. If satisfactory performance is observed during the performance phase but significantly degraded performance is observed during the safety phase then further investigation testing may be required to determine the reason for performance degradation.

c. Test procedure The Test shall be conducted according to a specific sequential test outline, to be tailored for particular ammunition configuration and/or specific environmental national requirements. For test plan management, data to record and assessment criteria see Annex E to STANAG 4224 Edition 3. In any case the test plan and programme shall clarify and justify any deviation from STANAG 4224 general directions.

13 ELECTROMAGNETIC RADIATION, ELECTROSTATIC DISCHARGE AND LIGHTNING

a. Reason for test This test is conducted to demonstrate that the cannon ammunition will remain safe and suitable for service following exposure to various electrical and electromagnetic environments.

b. Information Electromagnetic environments which the ammunition is expected to survive and remain suitable for service thereafter include the levels of electromagnetic radiation specified in STANAGs 1307 and 4234. Electromagnetic environments in which the ammunition is expected to remain safe include levels of environments in STANAG 4234, electrostatic discharge levels specified in STANAG 4235 and lightning levels specified in STANAG 4236.

c. Test Procedures The tests shall be conducted in accordance with STANAG 4324, STANAG 4239 with AOP 24 and STANAG 4327 with AOP 25, or national procedures.

ANNEX B TO
STANAG 4423
(Edition 2)

SUPPLEMENTARY TESTS

NOTE: The tests below may be required in addition to the Standard (mandatory) tests of Annex A, as dictated by the results of the logistics and hazard analyses per AOP-15 and the item design. As an interim measure, national procedures should be used for the conduct of these tests until NATO procedures are agreed and published.

1.	Logistic Vibration	(STANAG 4370, AECPT 400, Method 401 and STANAG 4242)
2.	General transportation Vibration	(STANAG 4370, AECTP 400, Method 401)
3.	Loose Cargo	(STANAG 4370, AECTP 400, Method 406)
4.	High Temperature Cycling	(STANAG 4370, AECTP 300, Method 302)
5.	Low Temperature Cycling	(STANAG 4370, AECTP 300, Method 303)
6.	Low Free Fall Drop	(STANAG 4370, AECTP 400, Method 403)
7.	Underwater Shock	(STANAG 4224 Edition 3 Annex F)
8.	Parachute Delivery	(National Procedures)
9.	Rain	(STANAG 4370, AECTP 300, Method 310)
10.	Salt Spray	(STANAG 4370, AECTP 300, Method 309)
11.	Dust and Sand	(STANAG 4370, AECTP 300, Method 314)
12.	Contamination by Fluids	(STANAG 4370, AECTP 300, Method 314)
13.	Sealing	(STANAG 4370, AECTP-300, Method 307)
14.	Tactical Vibration	(according to the applicable installed equipment vibration test schedule for the vehicle or national procedures)

15.	Handling free-fall (Unpackaged)	(STANAG 4370, AECTP 400, Method 403)
16.	Double Feed	(National procedures)
17.	Toxic contaminants	(National procedures)
18.	Noise/Muzzle blast	(National procedures)

The above list is not comprehensive. Other tests may be necessary and may be carried out in accordance with national documents or STANAGs if available.